

Reserving for Financial Guaranty Products

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Abstract:

This paper provides an overview of the types of financial guaranty products and current market characteristics. It also explores the basics and alternatives of developing reserving procedures for financial guaranty insurance products.

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CAS papers on financial guaranty actuarial methods, either pricing or reserving, are conspicuous by their absence. This lack of published research can be partly explained by the fact that it is a relatively new coverage. Most agree that financial guaranty insurance really began with the coverage of municipal bond obligations. The first such policy was written in 1971 and covered a general obligation bond issued by the city of Juneau, Alaska. Until 1985, financial guaranty information was reported under the surety line of business in the statutory statement. Up until that time, financial guaranty was almost exclusively limited to the municipal bond market. As late as 1998, municipal bonds still accounted for 80% of the premiums for monoline writers; however, there has been a recent explosion in the types of financial products insured by both monoline and multiline insurers.

Before beginning a discussion of the reserving practices of financial guaranty insurers, it is helpful to provide a description of the types of products that fall under this heading. In understanding the types of products, a history of the coverage and current market conditions, the reader will be better prepared to appreciate the various reserving techniques.

What Is / Is Not Financial Guaranty

The National Association of Insurance Commissioners' ("NAIC") Financial Guaranty Insurance Model Act gives the following definition:

"Financial guaranty insurance" means a surety bond, insurance policy or, when issued by an insurer, an indemnity contract and any guaranty similar to the foregoing types, under which loss is payable upon proof of occurrence of financial loss to an insured claimant, obligee or indemnitee as a result of any of the following events:

- (a) failure of any obligor on any debt instrument or other monetary obligation (including common or preferred stock guaranteed under a surety bond, insurance policy or indemnity contract) to pay when due principal, interest, premium, dividend or purchase price of or on such instrument or obligation, when such failure is the result of a financial default or insolvency, regardless of whether such obligation is incurred directly or as guarantor by or on behalf of another obligor that has also defaulted;

- (b) changes in the levels of interest rates, whether short or long term, or the differential in interest rates between various markets or products;
- (c) changes in the rate of exchange of currency;
- (d) inconvertibility of one currency into another for any reason, or inability to withdraw funds held in a foreign country resulting from restrictions imposed by a governmental authority;
- (e) changes in the value of specific assets or commodities, financial or commodity indices or price levels in general; or
- (f) other events which the commissioner determines are substantially similar to any of the foregoing.

The Model Act goes on to list numerous examples of what is not financial guaranty insurance, including various types of bonds, credit insurance, guaranteed investment contracts issued by life insurers, residual value insurance and mortgage guaranty insurance. While these types of insurance are not financial guaranty in the eyes of the NAIC's Model Act, they may be considered financial guaranty in other situations.

Perhaps a more broad definition of the coverage would simply be an insurance contract that guarantees a cash (or cash equivalent) payment from a security, or stream of such payments, at specified points in time.

The NAIC's Model Act led to the creation of the "monoline" company. The NAIC's regulations require monoline companies to write only financial guaranty, surety and, in some states, credit insurance. Conversely, companies that do not write financial guaranty (as defined by the NAIC) are often referred to as "multilines". Some multilines will write various types of financial guaranty coverage. Furthermore, several multiline reinsurers provide protection to the monoline companies.

As previously noted, financial guaranty began with coverage of municipal bond obligations. If the municipality was not able or willing to meet either its principal or interest obligations, the insurance contract would respond in a timely manner. In this case, the insurance contract guarantees the payment of principal and interest at the specified redemption dates. There is no question of fault with a financial guaranty insurance policy – the contract responds just by the fact that the bondholders did not

receive the cash payments. Of course, certain subrogation or collateral rights are transferred to the insurance company in the event of a claim.

Not all financial guaranty products are insured via a financial guaranty contract. Many of the multilines that write these types of coverage still do so with a more typical indemnification contract, which allows for the rights of reviewing and challenging claims.

Rationale for Financial Guaranty

In the case of an insured municipal bond, the benefits of financial guaranty insurance to the bondholder are obvious. The benefits to the issuer of the bond are not quite as immediately obvious, but no less real and include a) the fact that the bond is more “liquid”, especially in the secondary markets, and b) it has a higher credit rating. It is this second feature that often leads to the use of the term “credit enhancement” when describing financial guaranty products.

The purpose of purchasing credit enhancement insurance is to improve the credit rating on issued debt. Generally, investors will accept lower yields on debt instruments with higher credit ratings. Let’s consider “investment grade” bonds. Such bonds have been assigned one of the following credit ratings:

Investment Grade Rating Categories				
Standard & Poor’s, Fitch	AAA	AA	A	BBB
Moody’s	Aaa	Aa	A	Baa

Within each of these ratings is an implied rate of default. Based on prior experience, it is unlikely that there will be a default on any bonds rated as “investment grade”.

Corporate Default Probabilities by Rating Classifications								
<i>Average Cumulative Default Rates (%)</i>								
Term (yrs):	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>7</u>	<u>10</u>	<u>15</u>
AAA	0.00	0.00	0.03	0.06	0.10	0.26	0.51	0.51
AA	0.01	0.04	0.09	0.16	0.25	0.53	0.79	1.07
A	0.04	0.11	0.19	0.32	0.49	0.83	1.41	1.83
BBB	0.22	0.50	0.79	1.30	1.80	2.73	3.68	4.48
BB	0.98	2.97	5.35	7.44	9.22	12.27	15.00	16.36
B	5.30	11.28	15.88	19.10	21.44	24.77	27.88	29.96
CCC	21.94	29.25	34.37	38.24	42.13	44.40	46.53	48.29

Source: S&P CreditWeek, January 31, 2001

As this table indicates, the probability of default is low for all investment grades (i.e., BBB to AAA). However, the probability of default for bonds with a higher rating (e.g., AAA) is smaller than that for bonds with a lower rating (e.g., BBB). Depending on the type of industry and economic conditions, the difference in required yields between any two consecutive rating categories can be anywhere from 15 to 50 basis points (“bps”) or more. This difference is known as the **yield spread**.

The yield spread is the additional interest required by investors to compensate for accepting default risk. Historically the yield spread has been more than just the difference in expected defaults; investors demand a premium for accepting this risk. The risk adjusted default probability is typically about three times the historical default probability.

Any corporation or municipality issuing debt would like to minimize the amount of yield required by investors. Moving from one rating category to the next highest has the potential for significant savings in interest rate payments. Credit enhancement improves the rating of a debt instrument by insuring (i.e., guaranteeing) the interest and principal payments. If the corporation or municipality is unable to make interest or principal payments, the financial guaranty insurer makes the payments. The financial guaranty insurer typically has a very high rating. By agreeing to guarantee a debt obligation, the insurer is essentially lending its own rating to the debt issuing corporation or municipality.

The Association of Financial Guaranty Insurers (“AFGI”) estimates that bond insurance saved municipalities \$3.7 billion in borrowing costs during 1998. This savings is simply the realized yield reduction less the cost of insurance. In turn, the yield reduction is the result of borrowing at the financial guaranty insurer’s rating (e.g., AAA) instead of at the entities’ own credit rating (e.g., BBB, A-).

Types of Products and Insurers

While insurance for municipal bond obligations has historically been the largest category of financial guaranty insurance, it is not the only category nor is it likely to continue its domination of the coverage. The types of financial products that have been protected by financial guaranty insurance can be broken down as follows:

- Municipalities
 - Revenue Bonds
 - General Obligation Bonds
- Collateralized Debt Obligations (“CDO”)
 - Collateralized Bond Obligations (“CBO”)
 - Collateralized Loan Obligations (“CLO”)
 - Credit Card Receivables
 - Home Equity Loans
 - Automobile Loans
 - Collateralized Mortgage Obligations (“CMO”)
- Corporate Debt
 - Corporate Bonds
 - Subordinated Debt
 - Credit Default Swaps
 - Stand-alone
 - Synthetic CLO
- Other
 - Leases
 - Portfolios of Unsecured Loans
 - Emerging Markets
 - Film Production Rights
 - Cruise Ship Construction

As a matter of background, asset backed securities (“ABS”) are investments collateralized by loans or leases. For example, they could be a pool of car loans, student

loans or equipment leases. An artificial distinction is made in the US capital markets between CMO's and ABS's. So technically, an ABS is an investment collateralized by assets that are not mortgage loans.

There has been a recent trend by the multilines to financially guarantee almost all asset risk categories in the capital markets. In many instances, a very risky asset (e.g., cruise ship construction or future film production receivables) is insured in some way and converted into investment grade bonds.

Monoline companies, on the other hand, typically underwrite to a zero loss ratio ("ZLR"). That is not to say that there are never losses, but the potential for loss is very low. Insured assets have a higher grade debt with minimal chance of default. The limits are typically very large and the premiums are low. With low premium and high potential exposure, monoline insurers must focus on debt instruments that are very solid. A single loss could potentially wipe out several years' worth of premium.

Structured debt products underwritten by the multilines differ from ZLR products only to the extent that losses have a higher probability of occurring. That is not to say that losses on any single insured are expected at the time of underwriting. There is simply a higher frequency associated with the structured debt product. Most of the applications of structured debt are identical to that of ZLR products; namely, increase the credit rating of a debt obligation. However, the structured debt products represent an exposure to loss not in line with the ZLR products and, hence, are not acceptable to many "pure" financial guaranty writers. Furthermore, the monoline insurers' own credit rating is contingent upon minimal exposure (i.e., less than 10% of premiums) from high yield or junk bonds. These writers have been known to participate on some structured debt programs at very high layers, known as **capacity layers**.

Beside bonds, there are other types of exposures associated with structured debt. A classic example is lease obligations. Let's suppose a large corporation owns and then leases out some type of large machinery or real estate. The corporation may like to

guarantee the income stream from these leases. Such a program will typically be structured in various layers, or **tranches**, as shown in the following example:

- Equity
- Primary
- Mezzanine
- Capacity

The equity layer is the amount of risk often retained by the insured; in that respect it is similar to a deductible. For example, if we are looking at a portfolio of machinery leases, the insurance does not attach with the first late or defaulting lease payment. The insurance is typically designed to protect against a systematic economic failure in a particular industry. If the leases relate to commercial aircraft, the insurance would protect against a significant recession in the airline industry leading to cancelled leases. The loss of lease income from the failure of a small regional airline would probably be borne entirely by the insured.

Within the primary and mezzanine tranches, there can be several sub-dividing layers. For example, there may be Primary Layer I and Primary Layer II. While the capacity layer could be subdivided, in practice this is usually a very large amount of coverage attaching directly above the last mezzanine layer. As previously mentioned, traditional financial guaranty insurers seem to be more comfortable writing this layer. The lower layers are written by a combination of large commercial insurers and reinsurers.

This concept of layering or “tranching” asset backed securities is not limited to leases. In fact, it is a common feature of many transactions of this nature. Each tier has its own loss probabilities and, in fact, may have a different rating commensurate with the expected loss amounts.

The nomenclature used for identifying the tranches can be different from deal to deal. In some situations there has been an equity layer, a mezzanine layer and then a senior layer. In the most basic transactions, there have been just an equity tier and a senior tier. While

in general the equity layer has typically not been insured, there is an increasing trend to insure at least a portion of this tranche.

Market Analysis

Perhaps the dearth of relevant actuarial papers on the subject can be explained by the relatively small size of the credit enhancement market and the few number of companies that dominate it. As previously noted, US companies that write financial guaranty are required by law to be **monoline insurers** (see the following section on regulations). That is to say, a US domiciled company that writes financial guaranty insurance on a direct basis cannot write other lines of business. Having said that, there are some US companies that report premiums for both financial guaranty and other types of insurance in their statutory statements. For example, both Travelers and Fireman's Fund show small amounts of direct financial guaranty premiums written (i.e., \$1 – 2 million) and yet have over \$2 billion of premiums written in other lines. However, the very large US writers of financial guaranty write no other types of business.

For the calendar year 2000, the total financial guaranty premium written by all US insurers is shown below

2000 Financial Guaranty Premiums	
<i>All US Companies Combined</i>	
Direct Written	\$1.622 billion
Net Written	\$1.396 billion
<i>Source: Thomson Financial Insurance Solutions, May 2001</i>	

Of the \$1.622 billion in direct written premiums for financial guaranty, 94% is produced by only five groups of companies.

2000 Financial Guaranty Direct Premiums Written by Group (amounts in millions)	
Municipal Bond Investors Assurance Company Group ("MBIA")	\$623
AMBAC Assurance Corporation ("AMBAC")	\$433
Financial Security Assurance Holdings Limited ("FSA")	\$326
GE Capital (includes FGIC)	\$102
Enhance Financial Group ("Enhance" – note: now part of Radian)	\$37
<i>Source: Thomson Financial Insurance Solutions, May 2001.</i>	

Financial guaranty is considered to be very "capital intense"; it requires a significant amount of capital to underwrite this type of exposure. In fact, among the top financial writers there is an average 5:1 ratio of surplus to net premiums written. The table below shows the net written premium and corresponding surplus of the top six individual writers.

Top Financial Guaranty Writers – Surplus					
<i>2000 Results (amounts in thousands)</i>					
Company Name	S&P Insurance		Financial Guaranty	Surplus - Policyholders	Ratio of Surplus to NWP
	Rating	Group	Net Premiums Written		
MBIA Ins Corp	AAA	MBIA	489,242	2,381,669	4.868
AMBAC Assurance Corp	AAA	AMBAC	409,215	1,655,151	4.045
Financial Security Assurance Inc	AAA	FSA	137,238	797,369	5.810
Financial Guaranty Ins Co	AAA	GE Capital	84,141	1,089,826	12.952
Enhance Reinsurance Co	AAA	Radian	78,421	188,632	2.405
Ace Guaranty Re Inc	AAA	Ace	77,898	323,401	4.152
Total			1,276,155	6,436,048	5.043
<i>Source: Thomson Financial Insurance Solutions, May 2001</i>					

Note that each of the six companies shown above has a 2000 S&P rating of AAA. Most direct writers of financial guaranty carry a rating of AA- or above. Financial guaranty premiums account for 99% to 100% of the total net written premiums for each of these companies with the exception of Enhance Reinsurance Company and Ace Guaranty Reinsurance Company, for which the percentages are 97% and 98% respectively.

Since its inception in 1971, the US financial guaranty market has been controlled by a relatively small number of companies. The 1980's and 1990's saw a period of consolidation and mergers, reducing the number of companies to those shown above. In the future, there may be a few more additional entrants to this particular market; however the high capital requirements of this sector combined with the limited growth needs of the municipal bond market will undoubtedly serve to restrict the number of traditional financial guaranty writers to the single digits.

One area of potential growth lies with insuring corporate debt. The traditional monoline companies have been focused on municipal exposures (AFGI companies had over 80% of premiums from this sector in 1998), with ABS contributing much of the remainder. Stand-alone corporate debt is seldom insured in isolation – instead, baskets of corporate debt is usually preferred. Banks and other financial institutions are often in search of methods of securitizing debt exposure in a bid to offset regulatory capital and liquidity constraints. To meet the needs of this and other markets, it is possible that a new type of monoline company will emerge to focus exclusively on this type of exposure.

US Government Regulation

A series of bond defaults in the early 1980's led the NAIC and several states to adopt statutes and regulations specific to the financial guaranty insurance industry. The most important of these changes was the creation of the "monoline" company. The NAIC's regulations allow monoline companies to write only financial guaranty, surety and, in some states, credit insurance. Monoline companies cannot write certain exposures that many would consider to be financial guaranty products but are not considered financial guaranty under the Model Act. The minimum surplus and capital requirements for financial guaranty insurers vary from state to state, but in general the minimums are higher than those for any other type of property and casualty insurance company

Current regulations also require that companies writing financial guaranty establish special contingency reserves, shown as a write-in item under aggregate liabilities. The

contingency reserves are formula derived and can be considered to be highly punitive. Based on total dollars exposed, the contingency reserve dwarfs any reasonable loss and unearned premium reserves. It is basically a reserve based in proportion to the par value of all in-force policies.

To give an idea of the size of the contingency reserves, the following table compares the contingency reserves with the carried loss reserves for the top six financial guaranty writers:

Top Financial Guaranty Writers – Reserves				
<i>2000 Results (amounts in thousands)</i>				
Company Name	Group	Loss & LAE Reserves	Contingency Reserves	Ratio of Cont. Res. To Loss Res.
MBIA Ins Corp	MBIA	209,159	2,474,533	11.831
AMBAC Assurance Corp	AMBAC	23,989	1,062,686	44.299
Financial Security Assurance Inc	FSA	19,138	459,361	24.003
Financial Guaranty Ins Co	GE Capital	9,249	823,570	89.044
Enhance Reinsurance Co	Radian	18,743	260,168	13.881
Ace Guaranty Re Inc	ACE	14,972	180,584	12.061
Total		295,250	5,260,902	17.818

Source: Thomson Financial Insurance Solutions, May 2001; reserves are shown on a statutory basis.

In total for these six companies, the contingency reserves are approximately 18 times larger than the carried loss reserves. Note that the contingency reserve amounts were assumed to be the entire amount shown as an aggregate write-in liability item on the companies' statutory balance sheets. In actuality, there are a few other liability items that could show up in this account; however, the vast bulk of the write-in is for contingency reserves. The contingency reserve is a statutory item only; it is not required for GAAP purposes. There will be situations where a company is carrying a bulk loss reserve on a GAAP basis, but is not carrying a similar reserve on a statutory basis because the contingency reserve already serves this purpose.

With the implementation of these regulatory changes in the early 1980's, multiline companies could no longer write financial guaranty insurance, as defined by the NAIC.

The NAIC's definition of financial guaranty is somewhat restrictive and there are other credit enhancement products that the insurance industry would consider financial guaranty but the NAIC would not. This is one of the reasons that multiline insurers will still show premiums in their statutory statement under the financial guaranty line of business. Another reason that financial guaranty premiums still show up for multiline companies is that the premiums relate to long term policies (e.g., 30 year bond obligations) that were written prior to the regulations introduced in the mid 1980's.

Non-US Regulation

Outside of the US, there is little or no special government regulation of financial guaranty insurance. In the absence of government regulation limiting entry to the market, there have been many large multiline insurers entering the financial guaranty arena. However, these insurers are still subject to "market-regulation" by the rating agencies (i.e., S&P, Moody's, and Fitch).

During 2000, S&P recognized that multiline insurers participating in the financial guaranty arena did not always have the same commitment to the timely payment of claims that had been expected of and delivered by the monolines. Investors purchasing assets backed by financial guaranty insurance demand that interest and principal be paid on those dates specified in the financial agreement, whether those payments are made by the issuer or insurer. The monolines have demonstrated the ability and willingness to meet the financial market's expectation of timely, unconditional payments even in the event of fraud. Some multilines, on the other hand, have treated financial guaranty claims in the same manner as other traditional lines of insurance. For example, with a general liability claim the payment mechanisms include the rights of reviewing and challenging claims. With financial guaranty, claims should first be paid and then reviewed.

In recognition of the questionable claims practices of a few multilines participating in financial guaranty transactions, S&P introduced the Insurer Financial Enhancement Ratings (“FER”). While the traditional Insurer Financial Strength Ratings (“FSR”) measures the insurers ability to pay claims, the FER provides an indication of the insurer’s willingness to pay claims. Investors in financially enhanced instruments expect timely interest and principal payments; the FER rating is an example of the financial markets developing a mechanism to provide oversight in the absence of government regulation.

Reserving

For many years, accountants did not allow monoline companies to establish IBNR reserves, also known as “general” or “unallocated” reserves. The reasons were fairly simple and included the fact that once a bond went into default, the entire financial community would know about the failure and the insurer would then establish a case reserve. There could never be a “pure” IBNR claim, therefore there is no need for an IBNR reserve. There can be future development on known claims, but only when the insurer does not reserve for all future interest and principal payments or anticipates an excessive recovery rate.

Is there really a need for a general or IBNR reserve? We know if we have a large enough block of business, it will produce claims. Obviously the insurer does not know *a priori* which bonds will default or they would not have insured those bonds. However, the insurer has entered into numerous long term agreements (e.g., up to 30 years) during which some bonds will default. Almost immediately after a bond is issued, socio-economic changes begin to occur which might ultimately lead to a default on some bond.

We can be reasonably certain that the insurer has entered into one or more non-cancelable agreements that will produce a claim. It is important that the insurer reflect that liability on the balance sheet either in the unearned premium reserve or loss reserve, or a combination of the two.

The following methods explore reserving techniques currently used by insurers writing financial guaranty products. Some techniques are used by the monolines, while multiline carriers have adopted others. There may be some overlap of the reserve estimates produced by some of these methods and the unearned premium reserve. In each case it is necessary to have a clear understanding of the company's approach to earning premiums. For example, one company may earn the premium for a multi-year contract on a pro rata basis while another company would adopt an earning pattern that more closely matches the probability of loss. In such a situation, the amount of required loss reserves would probably be different for each company due to the fact that one of the companies is carrying more in unearned premium reserves.

Exposure Monitoring

As the name implies, this approach involves tracking each individual bond on a regular (e.g., monthly) basis. Each bond is placed into one of five categories:

1. Clean. These are bonds for "safe" municipalities, or ABSs, where the possibility of default has been judged to be extremely remote.
2. Clean with safety triggers. Certain contracts contain provisions calling for the periodic reporting of key financial data. Should the financial data fail to meet certain thresholds, safety triggers are tripped and the bond is put on a watch. In this case, the contract contains safety triggers but none have been tripped.

For corporate bonds there may be a sinking-fund provision that requires the issuing company to retire a certain percentage of the debt. Not retiring the complete percentage may activate a safety trigger. For a municipal airport revenue bond, a safety trigger may be the cancellation of certain routes from that airport, which will ultimately result in the loss of landing fees, fueling fees, concession fees, etc.

3. One or two safety triggers are tripped. In this case, some of the safety thresholds have been met, but the bond is not in immediate danger of default. The contract may call for additional reporting requirements and the insurance company will increase the diligence of its watch.

4. More safety triggers are tripped. The bond is still not in default, but the probability of default has increased significantly. The insurance company establishes case reserves based on the amount of principal and interest outstanding. The case reserves can be modified by the probability of default and the anticipated recovery percentage.

5. Bond is in default. The insurance company establishes case reserves based on the amount of principal and interest outstanding. The reserves can be reduced by the anticipated amount of recovery.

Loss Ratio Method

This tried and true method has some applicability within this industry. The monolines have produced the following calendar year loss ratios over the last five years.

Top Financial Guaranty Writers – Calendar Year Loss Ratios						
<i>Net Loss and Loss Adjustment Expense Ratios to Earned Premium</i>						
<u>Company Name</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>96-00</u>
MBIA Ins Corp	1.98%	1.45%	54.06%	12.32%	6.20%	17.33%
AMBAC Assurance Corp	-7.11%	1.65%	-7.16%	1.69%	3.64%	-0.65%
Financial Security Assurance	10.34%	5.15%	-6.12%	2.67%	-1.02%	1.22%
Financial Guaranty Ins Co	5.10%	5.55%	-2.91%	-2.53%	-0.39%	1.19%
Enhance Reinsurance Co	2.83%	2.10%	9.26%	4.73%	16.88%	7.77%
Ace Guaranty Re Inc	3.32%	0.51%	46.01%	-5.82%	-0.69%	7.04%
Composite	1.63%	2.52%	24.35%	5.38%	4.35%	8.15%

Source: Thomson Financial Insurance Solutions, May 2001

Ignoring the 1998 blip from MBIA and Ace (due to a single market event), this group of companies has had calendar year loss ratios over a five year period near 5%. While this

level of detail is not publicly available for the international multilines, ancillary information suggest that the financial guaranty business produced by this tier of companies runs in the 10% to 20% range.

As the variety of financial guaranty products increases, it becomes more difficult to make rule of thumb comments on the industry's loss ratio. While this line of business is generally characterized as low frequency and high severity, some insurers are dropping down into "working" or equity layers where there is a higher probability of loss and hence a higher absolute premium. There is one reinsurer whose premium on a particular credit enhancement product was 75% of the policy limits, indicating a very high probability of a loss.

Unallocated Reserves as a Percentage of Par Outstanding

This is the most common method of establishing reserves for the monoline companies. Industry studies of bond default using decades of financial results are used to determine appropriate reserve factors (i.e., probable loss amounts expressed as a percentage of par). The following table shows the unallocated reserves held by the monoline companies in relation to the total par outstanding insured.

Top Financial Guaranty Writers – Unallocated Reserves to Par Outstanding					
<i>1999 Results (amounts in millions)</i>					
	FSA	FGIC	AMBAC	MBIA	Composite
Par Outstanding	129,938	137,358	240,307	384,459	892,062
Unallocated Reserves	55	34	95	232	416
Ratio of Res to Par	0.042%	0.025%	0.039%	0.060%	0.047%
Source: Banc of America Securities, Equity Research, March 2, 2000; reserves are shown on a GAAP basis.					

Note that MBIA made an increase to unallocated reserves during 1999 of approximately \$153 million. Absent this increase, the industry would have ratios of unallocated reserves to par outstanding in the range of 0.02% to 0.04%.

Unallocated Reserves as a Percentage of Par Written

This is a relatively new method of establishing unallocated reserves. Also based on industry default studies, this method produces reserves as a percent of par written using a rate of between 50 to 200 basis points. As an unusual feature, the reserves are not reduced until a loss occurs or overall reserves have reached a “sufficient” level. As previously mentioned, this is a relatively new technique and companies have not yet reached reserve levels that would offset a “typical” municipal bond default.

Reserves Based on Default Probabilities - Deterministic

In this process, reserves are calculated on a contract-by-contract basis using industry default tables. An example of this approach is shown in the attached Exhibit 1. The required data for this technique includes:

1. Par Value
2. Coupon Rate
3. Expiration Date
4. Default Probability (from industry sources)
5. Anticipated Salvage Recovery Percentage

For each contract, the number of outstanding coupon payments is calculated along with the mean time until default. The mean time until default is the average number of years until default given that there has been a default in the policy period. This amount is calculated using incremental, as opposed to cumulative, default probabilities.

In the event of a default on a bond, the insurer will be able to eventually recover a significant portion of the loss payments. If the bond was a municipality, the city or county will reorganize and resume debt service payments. If it is a corporate bond that defaults, there will be some residual value such as product inventories in the insured company that can be used to offset some, if not all, of the loss payments. Industry studies suggest that a salvage recovery rate of 50% is reasonable, however it could be much more or less depending upon the circumstances. The recovery rate will typically be higher for municipalities than corporates. Whatever the anticipated salvage percentage, it will need

to be discounted to reflect the timing difference between the loss payment and the actual recovery. For example, a municipality may default on interest payments and the financial guaranty company responds by making those payments to investors. It is highly likely that the municipality will eventually make the overdue interest payments thereby indemnifying the insurance company for the losses paid. The insurance company can establish an asset for the anticipated recoveries (at least on a GAAP basis), but the asset should be calculated as the present value of the recoveries.

Many bonds are retired early, which terminates exposure to the insurer but does not result in a return of any premiums to the insured. Shortening the exposure period reduces the probability of default. The method described above could be modified to reflect the “expected” maturity date instead of the actual maturity date. Of course, this would result in lower reserve estimates.

Reserves Based on Default Probabilities - Stochastic

This technique is essentially the same as the previous method with the exception that several key variables are allowed to be stochastically determined. For example, the probability of default is a simple binomial experiment and the recovery rate can be based on the normal distribution (with appropriate limits in place to keep the simulated value from going above one or less than zero). On an expected basis, the deterministic and stochastic methods should produce identical results. The value of the stochastic approach is that it can produce ranges of reserve estimates at various confidence levels. In fact, this type of method can be used determine appropriate capital requirements if, for example, the company wants to set aside a capital amount sufficient to respond to a 1 in 1,000 event (i.e., 99.9% confidence level).

One area that deserves special attention with the simulation approach is that of correlation. While the probability of default is so minimal for municipals that correlation may not be a significant issue, correlation between corporate debt exposures should be factored into the stochastic model. One method suggested for measuring the debt correlation between two corporate counterparties is to study the correlation between their

equity prices. Incorporating correlation into the stochastic model will not change the expected value but will increase the variance.

Moody's Binomial Expansion Technique ("BET")

The rating agency, Moody's, promotes the use of the BET to calculate the expected losses of CBOs and CLOs. Underlying this technique, as used by Moody's, is the **diversity score concept**. The diversity score, D , represents a fictitious pool of D homogenous and uncorrelated bonds (or loans) that mimics the behavior of the original portfolio. In this hypothetical pool, all bonds have the same probability of default, p , which is the weighted average probability of default of the original pool. Furthermore, each asset has the same par value, which is calculated as the total collateral value divided by D . The calculation of the diversity score is beyond the scope of this paper, but the technique is mentioned for completeness.

The expected loss is calculated as follows:

$$\sum_{j=1}^D P_j \cdot E_j$$

Where: P_j is the probability of j defaults; and
 E_j is the present value of the outstanding assets (bonds or loans).

The probability of j defaults is calculated simply by the binomial formula as:

$$P_j = \frac{D!}{j!(D-j)!} p^j (1-p)^{D-j}$$

Reinsurance – Quota Share

There are a handful of specialized reinsurance companies that provide protection to the monoline companies, much of which is written on a quota share basis. The most basic approach to reserving in this situation is to use the reserves (or proxies thereof) of the underlying monoline carrier. Either through direct communication with insurance company or via market research, ratios of unallocated reserves to outstanding par are

computed by industry group (e.g., domestic municipal, domestic non-municipal, international, etc.). These ratios are then applied to the appropriate assumed par by industry group for each of the insureds. In this manner, the reinsurer maintains reserve levels that are consistent with the underlying insurer.

Reinsurance – Tranches

As previously noted, ABS instruments are often layered or trached with different (re)insurers participating on different layers. In some circumstances, one insurer will essentially “front” the deal and then cede various layers. In contrast with the traditional insurance market, the ceded layers may actually be the lower layers – those tranches with a higher probability of loss. In such situations, the rating agencies will often assign a rating to each layer commensurate with the expected loss amount. Given that the layer on which a (re)insurer is participating is rated (or a rating can be implied), techniques based on default tables can be used to estimate the reserve requirements.

Summary

The number of financial guaranty deals underwritten is growing at a fantastic rate, as are the different types of such products. In fact, the term “financial guaranty” is often dropped in favor of other more comprehensive terms such as “capital market products”. The lines between insurance and the capital markets are becoming more and more blurred. While the nomenclature in the capital markets is very different from that of the insurance industry, many of the underlying concepts will be familiar to actuaries. The need to evaluate the current financial implications of future contingent events is a common concern in both the capital and insurance markets. The actuary is ideally trained to measure these risks.

Historically, financial guaranty had been a line of business with an extremely low frequency and the potential for a very high severity. The need for a “general” loss reserve was often questioned. As the types and volume of transactions increase, “do we need a reserve” is being replaced by “how do we establish a reserve”.

The best reserving techniques can be selected for a given situation only after an analysis of the underlying exposure is completed. What triggers a loss? What is the frequency of claims? Is there any potential for salvage recoveries? How does the company earn premiums? How are the loss reserve and the unearned premium reserve related? What is the exposure period? Can insurance contracts be cancelled and, if so, by which party? In these respects, reserving for financial guaranty products is very similar to reserving for other lines of business. The best approach is determined only after an understanding of the risks is gained.

Reserves Based on Default Probabilities

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
<u>Counterparty</u>	<u>Rating</u>	<u>Coupon</u>	<u>Payable</u>	<u>Par</u>	<u>Maturity</u>	<u>Exposure</u>	<u>Prob of Default</u>	<u>Mean Time to Default</u>	<u>Interest Payments Outstanding</u>	<u>NPV of Salvage %</u>	<u>Reserve Amount</u>	
Apple County Sewage Plant	A	4.6%	Semi-annually	120,000,000	12/31/2008	7.0	0.83%	4.8	2.50	85.0%	166,581	
Cameron City General Obligation	BBB	5.2%	Semi-annually	15,000,000	6/30/2014	12.5	4.05%	6.1	6.50	85.0%	121,925	
Delphi Municipality	AA	4.9%	Annually	100,000,000	12/31/2015	14.0	1.01%	7.8	7.00	85.0%	203,465	
Waynestown Electric	BBB	5.1%	Semi-annually	5,000,000	12/15/2012	11.0	3.91%	5.9	5.50	85.0%	37,551	
Sub-Total (Municipals)				240,000,000							529,521	
											Ratio of Reserves to Par Outstanding	0.22%
Celston Apparel Co.	BBB	7.8%	Semi-annually	50,000,000	3/31/2008	6.2	2.29%	4.0	2.50	40.0%	820,965	
Fiberboard Inc.	A	7.4%	Semi-annually	75,000,000	5/30/2007	5.4	0.49%	3.7	2.00	40.0%	253,134	
Lakeland Industries	AA	7.1%	Semi-annually	28,500,000	12/31/2011	10.0	0.79%	6.5	3.50	40.0%	168,660	
Metalurgy Amalgamated Ltd.	BB	8.3%	Semi-annually	140,000,000	1/15/2005	3.0	5.35%	2.3	1.00	40.0%	4,867,002	
Quiet Comforters Inc.	A	7.6%	Semi-annually	10,000,000	12/31/2014	13.0	1.70%	7.4	6.00	40.0%	148,512	
Sub-Total (Corporates)				303,500,000							6,258,273	
											Ratio of Reserves to Par Outstanding	2.06%
Grand-Total				543,500,000							6,787,794	
											Ratio of Reserves to Par Outstanding	1.25%

Notes:

Evaluation Date 12/31/2001

- (3) Simple Interest
- (7) Number of years from evaluation date to maturity
- (8) From Exhibit 1, Page 2
- (9) In years; based on Exhibit 1, Page 2
- (10) Number of *annualized* interest payments outstanding between maturity date and mean time to default. For example, if the mean time to default occurs 19 months before the maturity of the bond, it is assumed that there are 3 semi-annual coupon payments remaining, which translates to 1.5 *annualized* coupon payments. In this same example, a bond paying interest annually instead of semi-annually would have 2 annualized coupon payments remaining.
- (11) In the event of default, there is a potential for a significant recovery of the loss payments. In the case of municipalities, a defaulting city or county has no choice but to reorganize and resume debt service payments. A corporation will have assets that can be liquidated. In each case, there is an issue of the time value of money from the point at which loss payments are made and salvage recoveries are received. The values shown are for demonstrative purposes only.
- (12) = (8) x [(3) x (5) x (10) + (5)] x [1 - (11)]

Reserves Based on Default Probabilities

Average Cumulative Default Rates

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AAA	0.00%	0.00%	0.03%	0.06%	0.10%	0.18%	0.26%	0.40%	0.45%	0.51%	0.51%	0.51%	0.51%	0.51%	0.51%
AA	0.01%	0.04%	0.09%	0.16%	0.25%	0.37%	0.53%	0.63%	0.70%	0.79%	0.85%	0.92%	0.96%	1.01%	1.07%
A	0.04%	0.11%	0.19%	0.32%	0.49%	0.65%	0.83%	1.01%	1.21%	1.41%	1.56%	1.65%	1.70%	1.73%	1.83%
BBB	0.22%	0.50%	0.79%	1.30%	1.80%	2.29%	2.73%	3.10%	3.39%	3.68%	3.91%	4.05%	4.22%	4.37%	4.48%
BB	0.98%	2.97%	5.35%	7.44%	9.22%	11.11%	12.27%	13.35%	14.29%	15.00%	15.65%	16.00%	16.29%	16.36%	16.36%
B	5.30%	11.28%	15.88%	19.10%	21.44%	23.20%	24.77%	26.01%	26.99%	27.88%	28.48%	28.96%	29.34%	29.68%	29.96%

Average Incremental Default Rates

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AAA	0.00%	0.00%	0.03%	0.03%	0.04%	0.08%	0.08%	0.14%	0.05%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%
AA	0.01%	0.03%	0.05%	0.07%	0.09%	0.12%	0.16%	0.10%	0.07%	0.09%	0.06%	0.07%	0.04%	0.05%	0.06%
A	0.04%	0.07%	0.08%	0.13%	0.17%	0.16%	0.18%	0.18%	0.20%	0.20%	0.15%	0.09%	0.05%	0.03%	0.10%
BBB	0.22%	0.28%	0.29%	0.51%	0.50%	0.49%	0.44%	0.37%	0.29%	0.29%	0.23%	0.14%	0.17%	0.15%	0.11%
BB	0.98%	1.99%	2.38%	2.09%	1.78%	1.89%	1.16%	1.08%	0.94%	0.71%	0.65%	0.35%	0.29%	0.07%	0.00%
B	5.30%	5.98%	4.60%	3.22%	2.34%	1.76%	1.57%	1.24%	0.98%	0.89%	0.60%	0.48%	0.38%	0.34%	0.28%

Note: These default probabilities are from S&P's CreditWeek January 31, 2001 and are based on corporate debt. Studies by both S&P and J.J.Kenny Co. Inc. indicate that the frequency of default for a domestic investment-grade corporation is greater than that of a similarly rated municipality. Therefore, in real world applications, this default table would not be appropriate for use with municipal bonds.

