MOODY'S INVESTORS SERVICE

RATING METHODOLOGY

# Hedge Fund Investment Portfolio Securitizations Methodology

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This rating methodology replaces *Hedge Fund Investment Portfolio Securitizations Methodology* published in December 2019. We added a footnote for further transparency on our approach to monitoring transactions, and we made limited editorial updates. The updates do not change the substantive approach of the methodology.

## Scope

This report describes our approach to rating transactions backed by portfolios of hedge fund investments,[1] collateralized funds of variable funding notes (HF VFNs) and hedge fund obligations (HF CFOs). Both are structured as market-value transactions that require periodic assessments of net asset value (NAV) and comparisons to predefined trigger levels. If the NAV falls below any of the trigger levels and the test violation is not cured within the prescribed timeframe, the underlying hedge funds are redeemed to preserve the value of the rated notes and bring the test back above the trigger levels.[2]

[1] Hedge fund investments refer to the ownership of investments in hedge funds. This can take several different forms, depending on the legal structure of the hedge fund (e.g., partnership interests, equity shares), or investors' investment options (e.g., direct investment in hedge funds, managed accounts where investor owned segregated accounts are managed by the hedge fund managers).

[2] The proceeds from redemptions can be used to pay down the rated notes or held in the deal as long as the test triggers are cured and the transaction is back in compliance.

### Hedge Fund-Backed Variable Funding Notes (HF VFNs)

HF VFNs are revolving credit facilities that banks offer to funds of hedge funds, typically to smooth over the lag in timing between an investor's request for redemption and the fund of funds' receipt of proceeds from redemptions of the underlying funds.[3] A fund of funds posts hedge fund interests as collateral against the money it borrows under these facilities. HF VFN tenors typically range from one to two years but are often renewed at the end of each term. The funds of funds pledge the underlying hedge fund investments against the notes drawn under the VFN.

These are direct lending agreements between banks and funds of hedge funds and do not involve special purpose vehicles (SPVs). In this arrangement, the bank is usually the calculation agent that produces monthly compliance/covenant reports for its own benefit. Since the bank seeks the return of principal without incurring losses, it has a strong incentive to closely monitor the lending arrangement, including the accuracy of calculations. Our ratings of the HF VFNs are for the benefit of the banks as the transaction "investors," and capture the expected loss posed to the investors due to their exposure to the fund of funds.

### Hedge Fund Collateralized Fund Obligations (HF CFOs)

HF CFOs are obligations of special purpose vehicles (SPVs) that are backed by a portfolio of hedge fund shares and are thus similar in structure to collateralized loan obligations.

## Rating Approach

In our approach to rating transactions backed by portfolios of hedge fund investments, we generally simulate hedge-fund returns by using a two-correlation regime economy, one during a normal economic scenario and another during a distressed scenario. We consider relevant structural features in a transaction, such as portfolio diversification and liquidity profile, and use a cash flow model to allocate payments to each class of notes and to estimate expected losses.

As with all rating methodologies, in applying this methodology, where appropriate, we consider all factors that we deem relevant to our analysis. In addition to the quantitative analysis, our rating committees also consider various qualitative factors in their analysis, and the assigned rating may differ from the model output.

## Asset-level Analysis and Related Modeling

### Hedge Fund Risk Factors

The potential volatility of an individual hedge fund is significant because its manager may own both long and short positions, use derivatives and leverage, and invest in a wide range of instruments beyond traditional stocks and bonds.

#### Portfolio Diversification

Portfolio diversification criteria are typically expressed as a percentage of the total NAV of the fund of funds portfolio. They can be structured in two different ways: The criteria have to be met at the start of the transaction or at the time a fund is purchased (incurrence tests), or on an ongoing basis (maintenance tests). In either case, we reflect those provisions in our modeling. For example, if a transaction incorporates incurrence tests on strategy or diversification constraints, we investigate the degree to which the actual



[3] We call them VFNs, but they can take the form of credit agreements between a bank/lender and fund of funds.

portfolio deviates from those constraints between each test and reflect the degree of deviation in our modeling, resulting in a highly concentrated portfolio in our modeling.

Diversification can be achieved with assets with low correlations in value over time. Fund of funds managers following a low-volatility strategy try to assemble a portfolio of relatively uncorrelated assets. We incorporate a diversification benefit by reflecting criteria such as minimum number of funds, a maximum percentage limit of a single fund of the total NAV and a maximum percentage limit on each of the strategies in our portfolio modeling. Generally, the more diversified and less correlated the portfolio, the lower the volatility of the fund of funds' value. However, if the diversification criteria are limited, we would have to stress our assumed volatilities or decline to rate the transaction.

Diversified portfolios with previously uncorrelated assets can become highly correlated for short periods. We use a specific high-correlation stress to model such behavior.

### Liquidity Profile

Hedge funds tend to have complicated and restrictive liquidity profiles. The ability to liquidate a hedge fund position in a timely fashion is influenced by factors such as:

» the allowed frequency of redemption

» the required notice period prior to redemption

» the existence and length of an initial lock-up period

» features such as "gates," "side pockets," or the outright ability to suspend redemptions

When relevant, we incorporate the risks described in our analysis.

### Transparency

The NAV of a fund of funds portfolio is the sum of the market values of each underlying hedge fund. The administrator of each underlying hedge fund reports the fund's valuation to the fund of funds manager, typically monthly. Because of the proprietary nature of current investments and the intense competition among hedge funds, managers do not generally reveal the positions of the underlying hedge funds.

Given the lack of transparency, fund of funds portfolio managers must depend on the accuracy of each hedge fund's reported value. There are a few factors to consider:

» The accuracy of a hedge fund's reported NAV depends largely on the degree of independence between the hedge fund administrator's valuation process and the hedge fund manager. Thus, having an administrator that is both reputable and independent is critical. We also consider the fund of funds manager's track record in selecting funds with high-quality administrators.

» The due diligence that the fund of funds portfolio manager conducts on hedge funds prior to investment can provide investors with insight into a fund's activities. This process can be very extensive, detailed and ongoing. A well-established process and experienced personnel enhance a fund of funds' ability to avoid potential pitfalls such as fraud.

» Although hedge funds are not subject to the same regulatory requirements as other investment vehicles, there are some protections for the fund of funds portfolio. One of these is the annual audit to which most hedge funds are subject.

Still, even with annual audits, independent fund administration and diligent CFO managers, limited transparency can cloak outright fraud and style drift (as the "Style Drift" section describes), which presents two distinct challenges to managers and rating agencies.

In a single hedge fund, both fraud and liquidity suspension can have a similar effect on a portfolio; both could result in rapid total loss of value. We have thus adopted in our rating methodology a specific total loss stress to address this risk.[4]

## Style Drift

Compared to fraud, style drift is a more subtle risk that arises from the limited transparency in hedge fund operations. A particular hedge fund manager can choose to focus on one or more strategies, often referred to as styles. A generic classification of hedge funds into the following five broad strategies[5] will serve to illustrate the concept:

**RELATIVE VALUE STRATEGY**: Exploits pricing inefficiencies of related financial assets by taking market-neutral positions. Sub-strategies include market-neutral equity, convertible arbitrage and yield curve arbitrage.

**EVENT-DRIVEN STRATEGY**: Profits from arbitrage opportunities that arise from events such as mergers, reorganizations and bankruptcies. Sub-strategies include mergers and reorganization arbitrage and bankruptcy/distressed investment.

**EQUITY STRATEGY**: Invests in public equities and owns long and short positions. Sub-strategies include long- or short-biased equity investing, industry sector investing and equity trading.

**GLOBAL MACRO**: Owns positions in a variety of instruments, including equities, bonds and currencies, based on anticipated changes in global economic conditions.

**MULTI-STRATEGY**: Uses a mix of strategies.

To better gauge the investment returns of hedge funds whose operations are opaque, a fund of funds portfolio manager can compare returns to associated indices and to similar funds to determine the degree of adherence of each fund to its professed style. The fund of funds manager can further investigate any evidence of style drift through discussions with underlying hedge fund managers.

To address the possibility of underestimating the volatility of the underlying fund values resulting from style drift, we may stress the volatility of particular funds if their behavior is markedly different from funds belonging to the same strategy. We also focus on fund of funds managers' due diligence procedures and on the surveillance procedures intended to identify those that deviate from their presumed styles.

Most concerns about the lack of transparency in a fund of funds transaction pertain to individual underlying hedge fund collateral. Because of restrictive investment agreements, managers will not necessarily reveal to investors the names of each hedge fund in the CFO portfolio. However, we do not rate notes in transactions unless the manager at least reveals the invested hedge fund names to both us and the fund of funds administrator.

[4] We discuss implementation in the modeling section. We apply a total loss percentage of 5% during a normal economy and 10% during a high-correlation economy.

[5] We divide these broad strategies into 29 narrower categories in the appendix for the purpose of assigning volatility and correlation values.

## Modeling

### Simulation of Hedge-Fund Returns

We consider a two-correlation regime economy: one during a normal economy and one during a distressed economy.

In addition to assuming a higher correlation in the distressed economy, our application of the total loss stress (to reflect the sudden loss of value in individual hedge funds) varies between the two. In the normal correlation regime, we simulate an indicator variable $I_{j,t}$ for fund $j \in \{1, \dots, n\}$ and month $t \in \{1, \dots, m\}$, equal to 1 with probability $1-(1-p)^{\frac{1}{12}}$, and 0 with probability $(1-p)^{\frac{1}{12}}$, where $p = 5\%$ is the annual total loss rate described above. In the stressed correlation regime, the default indicator becomes $\tilde{I}_{j,t}$, with the annual total loss rate $\tilde{p} = 10\%$. Note that even though these default indicators are independent, we introduce an implicit default correlation by increasing the total loss rate for all hedge funds in the high correlation regime.

Each iteration begins with the simulation of independent random vectors $Z_1 = \left(Z_{j,1}\right)_{1 \le j \le n}, \dots, Z_m = \left(Z_{j,m}\right)_{1 \le j \le n}$ following an $n$-dimensional t-distribution with mean 0, scale matrix $\Sigma$, and $\nu = 4$ or 5 degrees of freedom.[6, 7] Here, $\Sigma$ is the returns correlation matrix.

We use $\delta_t = \sum_{j=1}^{n} V_{j,t-1} Z_{j,t}$ as an indicator of the portfolio's performance in period $t$,[8] where $V_{j,s}$ denotes the value of fund $j \in \{1, \dots, n\}$ at time $s \in \{1, \dots, m\}$. Its variance is $\mathrm{Var}(\delta_t) = \bar{V}_{t-1}' \frac{\upsilon}{\upsilon - 2} \Sigma \bar{V}_{t-1}$ with $\bar{V}_s = \left(V_{j,s}\right)_{1 \le j \le s}, 1 \le s \le m$.

Let $F_\nu$ be the cumulative distribution of the t-distribution with $\nu$ degrees of freedom. For each period $t \in \{1, \dots, m\}$, if $\delta_t \ge F_\nu^{-1}(\alpha)\sqrt{\bar{V}_{t-1}' \Sigma \bar{V}_{t-1}}$, i.e., the portfolio performs better than the $\alpha$-percentile of the standard univariate t-distribution,[9] we assume that the economy is in its normal regime and the NAV of fund $j \in \{1, \dots, n\}$ is given by

$$V_{j,t} = (1 - I_{j,t}) V_{j,t-1} \, exp\left(\sqrt{\frac{\nu - 2}{\nu}} \sigma_j Z_{j,t}\right)$$

where $\sigma_j$ is the volatility of fund $j$.

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[6] This is the distribution of the random variable $\frac{Y}{\sqrt{X/\nu}}$ where $Y$ follows a Gaussian distribution with mean 0 and covariance matrix $\Sigma$, and $X$ follows a $\chi^2_\nu$ distribution. Its probability density function is given by:

$$\frac{\Gamma\left(\frac{\nu+n}{2}\right)}{\Gamma\left(\frac{\nu}{2}\right)(\nu\pi)^{\frac{n}{2}}|\det\Sigma|^{\frac{1}{2}}\left[1+\frac{1}{\nu}z'\Sigma^{-1}z\right]^{\frac{\nu+n}{2}}}, z \in \mathbb{R}^n$$

where $\Gamma$ is the Gamma function, $\det\Sigma$ is the determinant of $\Sigma$, and $'$ denotes transposition.

[7] Tranches rated Aa3 or higher require a degree-of-freedom parameter of four under the t-distribution; tranches rated A1 or lower require a degree-of-freedom parameter of five.

[8] This is a proxy for the portfolio's NAV in the current period; it is a convenient random variable because the sum of the correlated t-distributed random variables with $\nu$ degrees of freedom is still a t random variable with $\nu$ degrees of freedom.

[9] We choose for α a value of 5% (only coincidentally equal to the 5% total loss stress).

On the other hand, if $\delta_t < F_v^{-1}(\alpha)\sqrt{\bar{V}'_{t-1}\Sigma\bar{V}_{t-1}}$, we assume that the economy enters a period of distress, in which all hedge funds are highly correlated, and the NAV of fund $j \in \{1, \ldots, n\}$ is the result of

$$V_{j,t} = (1 - \tilde{I}_{j,t})V_{j,t-1}\, exp\left(\sqrt{\frac{\nu - 2}{\nu}}\sigma_j \tilde{Z}_{j,t}\right)$$

where $\tilde{Z}_t = \tilde{\Sigma}^{\frac{1}{2}}\Sigma^{-\frac{1}{2}}Z_t$, $\Sigma^{\frac{1}{2}}$ is the "square root matrix" from the Cholesky decomposition of $\Sigma$, $\Sigma^{-\frac{1}{2}}$ is its inverse, and $\tilde{\Sigma}$ is the stressed correlation matrix. (See the Appendix for more information.)

This simulation reflects the relevant structural features in a transaction. For example, the diversification criteria determine the portfolio shares attributable to each underlying fund and strategy and serve as the basis for determining the volatility the funds will use to generate return series. Also, the liquidity profile test helps determine the interval over which the model must simulate changes in NAV and produce the schedule of cash receipts.

This simulation also reflects some of the stresses that we might impose in our analysis. For example, in establishing the portfolio shares attributable to each underlying fund and strategy, we might allocate additional weight to funds with more volatility if we find certain funds of funds are more volatile than others of similar strategies and diversifications. Also, we might impose a longer liquidation period on funds that allow hedge funds with gates or side-pocket provisions.

## Structural Analysis and Liability Modeling

### Structural Protections

Both VFNs and CFOs have adopted several structural protections against illiquidity and lack of transparency, which we discuss below.

#### LTV/Over-Collateralization and Minimum Net Worth Tests

Loan to value (LTV) or over-collateralization (OC) tests provide critical credit protection for noteholders. In such tests, the fund of funds manager will test whether the ratio of the loan to the periodically determined value of the assets, discounted by the advance rates relevant to each of the rated notes, exceeds the LTV threshold. In an OC test, the manager will assess whether the discounted value of the assets exceeds indebtedness. If either test fails, the manager must sell assets, repay debt, purchase less risky assets (with higher advance rates) or contribute additional funds or equity to bring the portfolio back into compliance within a predetermined period. Failure to cure a test violation within this period will trigger an event of default and subsequent acceleration of payments of the rated notes. In the absence of such tests, we may be unable to rate the transactions because these tests are a major source of protection for the banks/noteholders and key inputs in our expected loss calculations.

Some transactions also incorporate a minimum net worth (MNW) test. If the adjusted net worth (net asset value minus the notional value of outstanding liabilities) of the fund of funds portfolio (calculated periodically) is lower than the required adjusted net worth, the manager must either cure the test by adding more equity or pay down liabilities. If the manager does not cure the MNW test within the predetermined timeframe, all the notes will be declared due immediately and the fund of funds portfolio assets will be liquidated to pay the liabilities. The MNW test, therefore, provides further protection to the noteholders against a decline in the portfolio's NAV.

### Liquidity Profile Test

Given the importance of specific liquidity provisions in the funds of hedge funds portfolio, managers adopt some form of liquidity profile test to limit the interval between issuance of a redemption notice and receipt of the liquidation proceeds for transactions in each underlying hedge fund. Each separate time interval is associated with the minimum percentage of NAV. For example, a very simple liquidity profile test would require that at least 50% of NAV be available within six months and 100% within one year. The covenanted liquidity profile takes into account the notice period, the redemption period and the initial lock-up period. The profile can also account for gate or side-pocket provisions. We take such liquidity covenants into account in our modeling in addition to the assessment of any liquidity facility that may be present.

### Equity Distribution Rules

Equity distribution rules in an HF CFO transaction specify the timing of the distribution of gains to the HF CFO equity investors. Typically, some threshold return level has to be met before equity holders receive any gains and we consider the presence of such distribution rules in our cash flow analysis.

## Cash Flow Model

Based on the structure of the transaction, we allocate the modeled cash flows from each period to the liabilities, including any rated notes. Thus, in each period, we model the payments of principal and interest to each class of notes as dictated by the cash flow waterfall. For each liability class, we calculate the present value of its cash flows for each iteration of the simulation. We calculate the loss as the greater of zero or the ratio of the present value of any cash shortfall to the promised cash flows. We average these loss numbers across all simulations to estimate the expected loss. We also calculate the sample standard deviation of the expected loss estimate as a measure of the uncertainty in the average value for the number of iterations used in the simulation. Finally, we compare the calculated expected loss to our Idealized Expected Loss tables to derive a model output.[10]

## Loss Benchmarks

In evaluating the model output for transactions backed by portfolios of hedge fund investments, we select loss benchmarks referencing the Idealized Expected Loss table[11] using the Standard Asymmetric Range, in which the lower-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the next higher rating category and the Idealized Expected Loss of the given rating category, respectively. For initial ratings and upgrade rating actions, the upper-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the given rating category and the Idealized Expected Loss of the next lower rating category, respectively. When monitoring a rating for downgrade, the upper-bound of loss is computed as a 50/50 weighted average on a logarithmic scale. That is, the benchmark boundaries of loss appropriate for evaluating rating category $R$ are given by:

[10] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in the "Loss Benchmarks" section.

[11] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

FORMULA 1

$$[1]\ Rating\ Lower\ Bound_R = exp\{0.8 \cdot log(Idealized\ Expected\ Loss_{R-1}) + 0.2 \cdot log(Idealized\ Expected\ Loss_R)\}$$

$$[2]\ Initial\ Rating\ Upper\ Bound_R = exp\{0.8 \cdot log(Idealized\ Expected\ Loss_R) + 0.2 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

$$[3]\ Current\ Rating\ Upper\ Bound_R = exp\{0.5 \cdot log(Idealized\ Expected\ Loss_R) + 0.5 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

Where:

» $Rating\ Lower\ Bound_R$ means the lowest Idealized Expected Loss associated with rating $R$ and the expected loss range of rating $R$ is inclusive of the $Rating\ Lower\ Bound_R$.

» $Initial\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating $R$ that is either initially assigned or upgraded and the expected loss range of rating $R$ is exclusive of the $Rating\ Upper\ Bound_R$.

» $Current\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating $R$ that is currently outstanding and the expected loss range of rating $R$ is exclusive of the $Rating\ Upper\ Bound_R$.

» $R\text{-}1$ means the rating just above $R$.

» $R+1$ means the rating just below $R$.

» The Rating Lower Bound for Aaa is 0% and the Rating Upper Bound for C is 100%. These are not derived using the formula.

*Source: Moody's Investors Service*

## Other Considerations

### Governance Risk

We evaluate the manager's due diligence and hedge fund selection process (including their ability to select diversified portfolios), risk controls, monitoring capability, technology infrastructure and other performance criteria.

We expect a manager's asset selection process to involve, at a minimum, a detailed review and assessment of the following concerns at the hedge fund level:

» Adherence to a reasonably detailed investment style over a number of years

» Documentation of a risk allocation policy and risk monitoring capability

» Monitoring of the volatility of returns

» Compliance with legal and regulatory reporting functions

» Communications with investors

» The role of accountants in auditing financial statements and in calculating net asset values, particularly with respect to illiquid assets

» Use of lock-up provisions, redemption restrictions and gate provisions

## Legal Risk

We review the legal structure of each transaction to ensure that the promise to repay the principal and interest on the rated notes is legally enforceable. In addition, we assess whether the collateral securing the rated notes is subject to a valid and perfected security interest.

HF CFOs and HF VFNs differ. HF CFOs are set up offshore as bankruptcy-remote SPVs, while HF VFNs are a bilateral purchase agreement involving direct lending from one party to the other. Thus, in rating CFOs, we also consider the bankruptcy remoteness of the SPV, the potential for consolidation of the SPV with its sponsor and the true sale of the collateral the SPV purchases.[12]

## Monitoring

Our approach to monitoring and reviewing the ratings of outstanding HF VFNs and HF CFOs is generally similar to the approach we use to assign initial ratings. We generally track key performance metrics such as LTV, OC, Minimum Net Worth levels and Investments (as applicable). We check compliance to portfolio quality tests such as portfolio diversification criteria and liquidity profile tests. We may also incorporate other information received from the transaction parties into our monitoring and review of transactions, such as periodic review of the transaction's performance with the manager.

We may consider a rating downgrade if the transaction breaches the LTV, OC, or Minimum Net Worth tests. We may consider a rating upgrade if the transaction consistently outperforms its covenanted metrics, its metrics initially modeled at closing of the transaction, or both.[13]

Certain components of the analysis conducted in the determination of initial ratings, such as the credit implications of the transaction's legal structure, will in most instances not be re-reviewed during the monitoring process unless a major market event, such as a widely publicized related legal ruling, indicates that a reconsideration is warranted.

[12] For more information, see our cross-sector methodology for our analysis of bankruptcy remoteness. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[13] For example, in methodologies where models are used, modeling is not relevant when it is determined that (1) a transaction is still revolving and performance has not changed from expectations, or (2) all tranches are at the highest achievable ratings and performance is at or better than expected performance, or (3) key model inputs are viewed as not having materially changed to the extent it would change outputs since the previous time a model was run, or (4) no new relevant information is available such that a model cannot be run in order to inform the rating, or (5) our analysis is limited to asset coverage ratios for transactions with undercollateralized tranches, or (6) a transaction has few remaining performing assets.

## Appendix A: Volatility and Correlation Assumptions

We have estimated hedge fund return volatility and correlation assumptions using data from HedgeFund.net. The database defines 29 strategies and covers 7,254 live funds and up to 251 monthly returns for each fund from September 1990 through July 2011. We filtered out funds with assets under management under $20 million, and with a track record shorter than 12 months. Such funds are not eligible in many hedge fund-backed structures that we rate. We would need to adjust the volatility, correlation and stressed correlation assumptions in Exhibits 1, 2 and 3 if eligibility criteria differed materially.

To calibrate our volatility assumption $\sigma_s$ for strategy $s$, we determine the standard deviation of a t-distribution that matches the one- and 99-percentiles of the corresponding empirical return distribution.[14]

For any particular strategy, we derive our return correlation assumption by taking the maximum of the empirical correlation and 0. Between two strategies A and B, we use the average correlation for pairs of strategies in A and B. We add one standard deviation to these correlations to obtain our stressed correlation assumptions.

Exhibit 1 shows our estimated return volatilities for each strategy using this approach. Exhibit 2 shows our assumed "normal-period" correlation assumptions, while Exhibit 3 presents our stress-period correlation parameters.

[14] See "*Post-2008 Crisis Hedge Fund Portfolio Modeling*," March 12, 2014.

EXHIBIT 1

**Estimated Return Volatilities**

| Strategy # | Strategy Name | Assumed Volatility |
|---|---|---|
| 1 | Asset Based Lending | 8.0% |
| 2 | Convertible Arbitrage | 16.0% |
| 3 | CTA/Managed Futures | 24.0% |
| 4 | Distressed | 15.0% |
| 5 | Emerging Markets | 32.0% |
| 6 | Energy Sector | 30.0% |
| 7 | Event Driven | 17.0% |
| 8 | Finance Sector | 15.0% |
| 9 | Fixed Income (non-arbitrage) | 14.0% |
| 10 | Fixed Income Arbitrage | 13.0% |
| 11 | Fund of Funds - Market Neutral | 9.0% |
| 12 | Fund of Funds - Multi-Strategy | 11.0% |
| 13 | Fund of Funds - Single Strategy | 14.0% |
| 14 | Healthcare Sector | 27.0% |
| 15 | Long Only | 23.0% |
| 16 | Long/Short Equity | 20.0% |
| 17 | Macro | 21.0% |
| 18 | Market Neutral Equity | 13.0% |
| 19 | Merger/Risk Arbitrage | 9.0% |
| 20 | Mortgages | 16.0% |
| 21 | Multi-Strategy | 17.0% |
| 22 | Options Strategies | 25.0% |
| 23 | Regulation D | 24.0% |
| 24 | Short Bias | 17.0% |
| 25 | Small/Micro Cap | 20.0% |
| 26 | Special Situations | 26.0% |
| 27 | Statistical Arbitrage | 13.0% |
| 28 | Technology Sector | 31.0% |
| 29 | Value | 25.0% |

*Source: Moody's Investors Service*

EXHIBIT 2

## Normal Correlation Matrix

| Strategy # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15.10% | 3.39% | 4.82% | 1.70% | 0.01% | 0.00% | 1.63% | 3.46% | 4.00% | 5.21% | 1.19% | 2.38% | 2.87% | 2.96% | 0.00% | 0.90% | 3.03% | 0.64% | 3.04% | 5.62% | 2.61% | 2.79% | 5.64% | 3.35% | 0.00% | 1.75% | 5.60% | 0.92% | 0.00% |
| 2 | 3.39% | 68.35% | 5.26% | 47.93% | 46.07% | 42.22% | 39.11% | 26.73% | 27.85% | 29.07% | 56.76% | 52.76% | 45.91% | 39.51% | 53.50% | 33.80% | 21.16% | 17.97% | 36.08% | 34.70% | 37.13% | 12.72% | 19.95% | 0.00% | 44.16% | 43.51% | 26.57% | 45.95% | 46.18% |
| 3 | 4.82% | 5.26% | 26.86% | 3.85% | 8.39% | 9.15% | 4.83% | 7.04% | 2.69% | 4.41% | 11.93% | 18.34% | 19.18% | 2.94% | 7.38% | 10.07% | 12.78% | 4.26% | 2.81% | 2.05% | 11.52% | 2.01% | 0.54% | 0.00% | 5.37% | 5.54% | 4.45% | 7.82% | 5.57% |
| 4 | 1.70% | 47.93% | 3.85% | 49.36% | 40.95% | 41.08% | 36.50% | 24.80% | 22.57% | 20.93% | 51.26% | 47.86% | 42.18% | 34.90% | 47.17% | 30.28% | 17.73% | 16.18% | 23.09% | 30.26% | 32.10% | 8.98% | 18.60% | 0.00% | 43.51% | 37.78% | 20.95% | 41.94% | 42.71% |
| 5 | 0.01% | 46.07% | 8.39% | 40.95% | 46.88% | 40.37% | 32.75% | 22.00% | 18.19% | 18.99% | 47.02% | 47.86% | 44.33% | 34.66% | 50.46% | 32.64% | 22.63% | 17.35% | 27.04% | 22.08% | 32.29% | 8.57% | 16.04% | 0.00% | 42.42% | 36.50% | 18.23% | 44.83% | 43.26% |
| 6 | 0.00% | 42.22% | 9.15% | 41.08% | 40.37% | 47.25% | 32.38% | 18.49% | 17.43% | 16.45% | 51.07% | 48.12% | 43.17% | 28.40% | 45.89% | 30.33% | 18.98% | 17.11% | 20.97% | 23.42% | 29.81% | 7.75% | 17.62% | 0.00% | 41.38% | 35.22% | 20.56% | 43.32% | 40.55% |
| 7 | 1.63% | 39.11% | 4.83% | 36.50% | 32.75% | 32.38% | 30.31% | 20.67% | 18.99% | 17.01% | 40.61% | 39.37% | 34.98% | 29.05% | 39.19% | 25.73% | 15.78% | 14.02% | 25.46% | 22.91% | 25.98% | 7.74% | 16.83% | 0.00% | 34.84% | 29.80% | 15.94% | 36.39% | 34.34% |
| 8 | 3.46% | 26.73% | 7.04% | 24.80% | 22.00% | 18.49% | 20.67% | 33.05% | 12.62% | 12.06% | 23.09% | 28.68% | 26.99% | 23.52% | 30.21% | 23.00% | 14.44% | 11.42% | 18.83% | 15.00% | 19.60% | 3.21% | 10.04% | 0.00% | 24.91% | 20.41% | 15.38% | 25.33% | 26.33% |
| 9 | 4.00% | 27.85% | 2.69% | 22.57% | 18.19% | 17.43% | 18.99% | 12.62% | 15.37% | 14.01% | 25.11% | 22.33% | 19.28% | 15.74% | 20.71% | 13.62% | 9.37% | 7.57% | 15.08% | 19.71% | 15.99% | 5.51% | 11.17% | 0.00% | 19.26% | 18.95% | 13.31% | 19.57% | 18.99% |
| 10 | 5.21% | 29.07% | 4.41% | 20.93% | 18.99% | 16.45% | 17.01% | 12.06% | 14.01% | 15.49% | 26.32% | 23.81% | 20.48% | 16.93% | 19.67% | 13.19% | 9.01% | 7.33% | 15.76% | 18.27% | 16.06% | 7.03% | 8.34% | 0.00% | 16.54% | 19.67% | 12.09% | 17.11% | 16.64% |
| 11 | 1.19% | 56.76% | 11.93% | 51.26% | 47.02% | 51.07% | 40.61% | 23.09% | 25.11% | 26.32% | 71.33% | 65.46% | 56.73% | 36.39% | 50.36% | 34.73% | 23.38% | 22.02% | 29.46% | 30.85% | 39.71% | 9.95% | 20.03% | 0.00% | 46.00% | 43.41% | 20.57% | 46.64% | 42.90% |
| 12 | 2.38% | 52.76% | 18.34% | 47.86% | 47.86% | 48.12% | 39.37% | 28.68% | 22.33% | 23.81% | 65.46% | 65.78% | 59.37% | 38.90% | 53.00% | 38.29% | 26.78% | 22.18% | 29.97% | 25.80% | 40.11% | 9.25% | 17.96% | 0.00% | 46.23% | 42.14% | 20.36% | 51.19% | 45.35% |
| 13 | 2.87% | 45.91% | 19.18% | 42.18% | 44.33% | 43.17% | 34.98% | 26.99% | 19.28% | 20.48% | 56.73% | 59.37% | 54.31% | 35.54% | 49.30% | 35.93% | 25.57% | 19.90% | 27.20% | 21.63% | 36.39% | 8.84% | 15.61% | 0.00% | 42.39% | 37.49% | 18.13% | 47.70% | 41.96% |
| 14 | 2.96% | 39.51% | 2.94% | 34.90% | 34.66% | 28.40% | 29.05% | 23.52% | 15.74% | 16.93% | 36.39% | 38.90% | 35.54% | 46.89% | 42.93% | 28.21% | 17.91% | 13.85% | 30.40% | 16.47% | 27.62% | 6.67% | 14.09% | 0.00% | 34.67% | 31.13% | 13.83% | 41.67% | 36.92% |
| 15 | 0.00% | 53.50% | 7.38% | 47.17% | 50.46% | 45.89% | 39.19% | 30.21% | 20.71% | 19.67% | 50.36% | 53.00% | 49.30% | 42.93% | 62.43% | 39.47% | 24.08% | 17.53% | 34.07% | 21.05% | 36.28% | 9.18% | 18.64% | 0.00% | 51.19% | 40.87% | 18.92% | 56.07% | 54.07% |
| 16 | 0.90% | 33.80% | 10.07% | 30.28% | 32.64% | 30.33% | 25.73% | 23.00% | 13.62% | 13.19% | 34.73% | 38.29% | 35.93% | 28.21% | 39.47% | 27.72% | 17.89% | 13.99% | 21.83% | 14.84% | 25.26% | 6.19% | 12.90% | 0.00% | 33.16% | 26.53% | 13.48% | 37.71% | 33.94% |
| 17 | 3.03% | 21.16% | 12.78% | 17.73% | 22.63% | 18.98% | 15.78% | 14.44% | 9.37% | 9.01% | 23.38% | 26.78% | 25.57% | 17.91% | 24.08% | 17.89% | 15.20% | 8.85% | 12.95% | 8.55% | 17.79% | 3.36% | 8.33% | 0.00% | 19.62% | 18.37% | 10.37% | 22.62% | 20.54% |
| 18 | 0.64% | 17.97% | 4.26% | 16.18% | 17.35% | 17.11% | 14.02% | 11.42% | 7.57% | 7.33% | 22.02% | 22.18% | 19.90% | 13.85% | 17.53% | 13.99% | 8.85% | 12.56% | 11.79% | 9.65% | 13.03% | 4.77% | 8.31% | 0.00% | 17.06% | 14.79% | 8.47% | 18.74% | 14.56% |
| 19 | 3.04% | 36.08% | 2.81% | 23.09% | 27.04% | 20.97% | 25.46% | 18.83% | 15.08% | 15.76% | 29.46% | 29.97% | 27.20% | 30.40% | 34.07% | 21.83% | 12.95% | 11.79% | 45.74% | 14.22% | 20.54% | 10.83% | 10.84% | 0.00% | 23.66% | 21.61% | 9.52% | 33.83% | 25.49% |
| 20 | 5.62% | 34.70% | 2.05% | 30.26% | 22.08% | 23.42% | 22.91% | 15.00% | 19.71% | 18.27% | 30.85% | 25.80% | 21.63% | 16.47% | 21.05% | 14.84% | 8.55% | 9.65% | 14.22% | 39.55% | 18.30% | 8.62% | 17.73% | 0.00% | 21.84% | 24.39% | 21.14% | 25.93% | 19.60% |
| 21 | 2.61% | 37.13% | 11.52% | 32.10% | 32.29% | 29.81% | 25.98% | 19.60% | 15.99% | 16.06% | 39.71% | 40.11% | 36.39% | 27.62% | 36.28% | 25.26% | 17.79% | 13.03% | 20.54% | 18.30% | 26.49% | 7.23% | 12.53% | 0.00% | 31.07% | 28.44% | 15.44% | 33.61% | 31.55% |
| 22 | 2.79% | 12.72% | 2.01% | 8.98% | 8.57% | 7.75% | 7.74% | 3.21% | 5.51% | 7.03% | 9.95% | 9.25% | 8.84% | 6.67% | 9.18% | 6.19% | 3.36% | 4.77% | 10.83% | 8.62% | 7.23% | 5.74% | 4.01% | 0.00% | 7.58% | 6.63% | 2.76% | 7.07% | 7.40% |
| 23 | 5.64% | 19.95% | 0.54% | 18.60% | 16.04% | 17.62% | 16.83% | 10.04% | 11.17% | 8.34% | 20.03% | 17.96% | 15.61% | 14.09% | 18.64% | 12.90% | 8.33% | 8.31% | 10.84% | 17.73% | 12.53% | 4.01% | 4.64% | 0.00% | 17.74% | 17.81% | 14.57% | 20.00% | 17.62% |
| 24 | 3.35% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 62.43% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 25 | 0.00% | 44.16% | 5.37% | 43.51% | 42.42% | 41.38% | 34.84% | 24.91% | 19.26% | 16.54% | 46.00% | 46.23% | 42.39% | 34.67% | 51.19% | 33.16% | 19.62% | 17.06% | 23.66% | 21.84% | 31.07% | 7.58% | 17.74% | 0.00% | 46.86% | 35.97% | 17.55% | 48.21% | 46.00% |
| 26 | 1.75% | 43.51% | 5.54% | 37.78% | 36.50% | 35.22% | 29.80% | 20.41% | 18.95% | 19.67% | 43.41% | 42.14% | 37.49% | 31.13% | 40.87% | 26.53% | 18.37% | 14.79% | 21.61% | 24.39% | 28.44% | 6.63% | 17.81% | 0.00% | 35.97% | 37.28% | 23.84% | 36.01% | 36.31% |
| 27 | 5.60% | 26.57% | 4.45% | 20.95% | 18.23% | 20.56% | 15.94% | 15.38% | 13.31% | 12.09% | 20.57% | 20.36% | 18.13% | 13.83% | 18.92% | 13.48% | 10.37% | 8.47% | 9.52% | 21.14% | 15.44% | 2.76% | 14.57% | 0.00% | 17.55% | 23.84% | 15.00% | 15.62% | 17.83% |
| 28 | 0.92% | 45.95% | 7.82% | 41.94% | 44.83% | 43.32% | 36.39% | 25.33% | 19.57% | 17.11% | 46.64% | 51.19% | 47.70% | 41.67% | 56.07% | 37.71% | 22.62% | 18.74% | 33.83% | 25.93% | 33.61% | 7.07% | 20.00% | 0.00% | 48.21% | 36.01% | 15.62% | 64.11% | 46.92% |
| 29 | 0.00% | 46.18% | 5.57% | 42.71% | 43.26% | 40.55% | 34.34% | 26.33% | 18.99% | 16.64% | 42.90% | 45.35% | 41.96% | 36.92% | 54.07% | 33.94% | 20.54% | 14.56% | 25.49% | 19.60% | 31.55% | 7.40% | 17.62% | 0.00% | 46.00% | 36.31% | 17.83% | 46.92% | 47.42% |

*Source: Moody's Investors Service*

EXHIBIT 3

## Stressed Correlation Matrix

| Strategy # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 39.57% | 19.32% | 19.52% | 19.25% | 17.66% | 13.24% | 18.15% | 19.71% | 23.20% | 22.49% | 13.17% | 17.24% | 18.96% | 15.28% | 15.56% | 17.74% | 20.71% | 17.17% | 17.19% | 24.94% | 20.10% | 20.62% | 26.39% | 22.24% | 11.34% | 18.00% | 25.83% | 14.09% | 14.81% |
| 2 | 19.32% | 92.80% | 31.92% | 73.68% | 73.10% | 69.96% | 67.19% | 45.22% | 63.19% | 58.86% | 79.58% | 76.33% | 74.41% | 62.50% | 76.08% | 61.61% | 53.99% | 45.09% | 57.34% | 56.92% | 68.03% | 48.87% | 50.34% | 0.00% | 68.18% | 66.83% | 52.19% | 66.16% | 69.88% |
| 3 | 19.52% | 31.92% | 55.74% | 26.70% | 33.60% | 33.35% | 25.86% | 24.79% | 24.24% | 25.94% | 36.83% | 45.53% | 47.49% | 23.51% | 33.48% | 32.43% | 38.32% | 22.27% | 21.16% | 21.93% | 37.90% | 24.53% | 24.61% | 21.99% | 27.42% | 27.81% | 23.87% | 28.89% | 29.25% |
| 4 | 19.25% | 73.68% | 26.70% | 75.20% | 66.76% | 66.49% | 64.19% | 41.35% | 54.90% | 49.84% | 73.83% | 70.43% | 68.67% | 55.98% | 68.38% | 55.46% | 46.58% | 40.17% | 44.49% | 54.45% | 60.69% | 40.36% | 49.56% | 0.00% | 66.57% | 58.97% | 47.50% | 61.85% | 64.65% |
| 5 | 17.66% | 73.10% | 33.60% | 66.76% | 76.91% | 68.47% | 60.76% | 41.10% | 49.62% | 46.66% | 72.78% | 73.19% | 72.03% | 58.95% | 76.49% | 60.69% | 54.21% | 42.55% | 50.23% | 43.97% | 62.06% | 40.82% | 44.74% | 0.00% | 69.05% | 60.75% | 43.31% | 67.43% | 69.39% |
| 6 | 13.24% | 69.96% | 33.35% | 66.49% | 68.47% | 79.36% | 60.02% | 33.96% | 46.82% | 42.33% | 76.65% | 73.96% | 70.86% | 49.42% | 70.49% | 57.33% | 48.68% | 41.85% | 42.75% | 47.30% | 59.67% | 39.71% | 49.58% | 0.00% | 67.01% | 58.93% | 45.70% | 66.70% | 65.43% |
| 7 | 18.15% | 67.19% | 25.86% | 64.19% | 60.76% | 60.02% | 59.56% | 38.09% | 49.00% | 43.08% | 68.07% | 66.51% | 63.42% | 52.15% | 65.11% | 51.19% | 43.25% | 36.72% | 47.89% | 45.51% | 54.44% | 37.16% | 44.17% | 0.00% | 60.59% | 53.44% | 41.62% | 59.73% | 59.80% |
| 8 | 19.71% | 45.22% | 24.79% | 41.35% | 41.10% | 33.96% | 38.09% | 64.63% | 34.41% | 31.96% | 35.92% | 47.23% | 46.62% | 41.19% | 50.74% | 43.70% | 38.53% | 30.46% | 37.11% | 34.06% | 39.52% | 24.56% | 36.88% | 0.00% | 43.30% | 35.93% | 40.01% | 41.24% | 47.39% |
| 9 | 23.20% | 63.19% | 24.24% | 54.90% | 49.62% | 46.82% | 49.00% | 34.41% | 46.63% | 41.65% | 56.17% | 52.89% | 49.70% | 42.48% | 53.34% | 40.68% | 36.30% | 30.71% | 39.42% | 46.45% | 45.18% | 32.42% | 37.35% | 17.86% | 48.18% | 46.74% | 39.56% | 47.61% | 49.26% |
| 10 | 22.49% | 58.86% | 25.94% | 49.84% | 46.66% | 42.33% | 43.08% | 31.96% | 41.65% | 43.45% | 55.36% | 51.85% | 48.36% | 39.60% | 48.08% | 37.36% | 34.69% | 28.37% | 37.94% | 42.96% | 42.86% | 33.49% | 32.87% | 16.04% | 41.79% | 43.42% | 33.41% | 40.81% | 42.44% |
| 11 | 13.17% | 79.58% | 36.83% | 73.83% | 72.78% | 76.65% | 68.07% | 35.92% | 56.17% | 55.36% | 96.12% | 89.31% | 83.78% | 54.12% | 70.02% | 59.25% | 53.95% | 46.48% | 48.65% | 55.73% | 69.46% | 44.33% | 55.43% | 0.00% | 65.68% | 64.82% | 48.04% | 60.79% | 63.69% |
| 12 | 17.24% | 76.33% | 45.53% | 70.43% | 73.19% | 73.96% | 66.51% | 47.23% | 52.89% | 51.85% | 89.31% | 88.36% | 84.81% | 59.09% | 73.99% | 64.17% | 58.62% | 47.26% | 51.64% | 47.84% | 69.18% | 43.45% | 53.82% | 0.00% | 69.08% | 63.48% | 48.78% | 68.67% | 68.15% |
| 13 | 18.96% | 74.41% | 47.49% | 68.67% | 72.03% | 70.86% | 63.42% | 46.62% | 49.70% | 48.36% | 83.78% | 84.81% | 82.01% | 58.61% | 75.16% | 62.79% | 57.26% | 45.09% | 50.78% | 44.88% | 66.29% | 42.05% | 49.80% | 0.00% | 68.46% | 60.63% | 46.20% | 70.02% | 68.09% |
| 14 | 15.28% | 62.50% | 23.51% | 55.98% | 58.95% | 49.42% | 52.15% | 41.19% | 42.48% | 39.60% | 54.12% | 59.09% | 58.61% | 73.11% | 64.68% | 51.91% | 46.19% | 34.45% | 49.14% | 33.18% | 52.52% | 34.58% | 41.47% | 0.00% | 57.05% | 50.49% | 39.09% | 58.77% | 60.31% |
| 15 | 15.56% | 76.08% | 33.48% | 68.38% | 76.49% | 70.49% | 65.11% | 50.74% | 53.34% | 48.08% | 70.02% | 73.99% | 75.16% | 64.68% | 81.70% | 67.93% | 58.72% | 43.46% | 56.32% | 40.10% | 66.05% | 44.55% | 48.72% | 0.00% | 74.99% | 61.32% | 43.45% | 73.03% | 76.64% |
| 16 | 17.74% | 61.61% | 32.43% | 55.46% | 60.69% | 57.33% | 51.19% | 43.70% | 40.68% | 37.36% | 59.25% | 64.17% | 62.79% | 51.91% | 67.93% | 54.65% | 46.97% | 36.93% | 44.18% | 35.62% | 52.49% | 34.42% | 41.81% | 0.00% | 59.47% | 49.77% | 37.72% | 63.08% | 61.53% |
| 17 | 20.71% | 53.99% | 38.32% | 46.58% | 54.21% | 48.68% | 43.25% | 38.53% | 36.30% | 34.69% | 53.95% | 58.62% | 57.26% | 46.19% | 58.72% | 46.97% | 45.50% | 31.49% | 38.47% | 30.19% | 47.18% | 31.17% | 34.41% | 17.29% | 50.20% | 45.21% | 34.46% | 53.14% | 52.25% |
| 18 | 17.17% | 45.09% | 22.27% | 40.17% | 42.55% | 41.85% | 36.72% | 30.46% | 30.71% | 28.37% | 46.48% | 47.26% | 45.09% | 34.45% | 43.46% | 36.93% | 31.49% | 36.17% | 33.57% | 32.16% | 37.55% | 27.55% | 32.69% | 16.85% | 40.17% | 37.48% | 31.80% | 41.36% | 39.01% |
| 19 | 17.19% | 57.34% | 21.16% | 44.49% | 50.23% | 42.75% | 47.89% | 37.11% | 39.42% | 37.94% | 48.65% | 51.64% | 50.78% | 49.14% | 56.32% | 44.18% | 38.47% | 33.57% | 67.71% | 35.78% | 45.59% | 38.38% | 33.10% | 0.55% | 46.05% | 43.55% | 31.24% | 51.36% | 48.66% |
| 20 | 24.94% | 56.92% | 21.93% | 54.45% | 43.97% | 47.30% | 45.51% | 34.06% | 46.45% | 42.96% | 55.73% | 47.84% | 44.88% | 33.18% | 40.10% | 35.62% | 30.19% | 32.16% | 35.78% | 69.25% | 43.07% | 31.16% | 37.76% | 8.42% | 41.86% | 43.97% | 42.61% | 44.20% | 38.44% |
| 21 | 20.10% | 68.03% | 37.90% | 60.69% | 62.06% | 59.67% | 54.44% | 39.52% | 45.18% | 42.86% | 69.46% | 69.18% | 66.29% | 52.52% | 66.05% | 52.49% | 47.18% | 37.55% | 45.59% | 43.07% | 56.36% | 36.85% | 41.95% | 2.81% | 59.09% | 53.88% | 41.01% | 60.05% | 59.83% |
| 22 | 20.62% | 48.87% | 24.53% | 40.36% | 40.82% | 39.71% | 37.16% | 24.56% | 32.42% | 33.49% | 44.33% | 43.45% | 42.05% | 34.58% | 44.55% | 34.42% | 31.17% | 27.55% | 38.38% | 31.16% | 36.85% | 36.38% | 28.40% | 31.28% | 38.20% | 36.17% | 27.96% | 38.41% | 39.98% |
| 23 | 26.39% | 50.34% | 24.61% | 49.56% | 44.74% | 49.58% | 44.17% | 36.88% | 37.35% | 32.87% | 55.43% | 53.82% | 49.80% | 41.47% | 48.72% | 41.81% | 34.41% | 32.69% | 33.10% | 37.76% | 41.95% | 28.40% | 33.94% | 14.44% | 49.50% | 42.90% | 37.24% | 48.94% | 47.39% |
| 24 | 22.24% | 0.00% | 21.99% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 17.86% | 16.04% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 17.29% | 16.85% | 0.55% | 8.42% | 2.81% | 31.28% | 14.44% | 93.84% | 0.00% | 0.00% | 6.06% | 0.00% | 0.00% |
| 25 | 11.34% | 68.18% | 27.42% | 66.57% | 69.05% | 67.01% | 60.59% | 43.30% | 48.18% | 41.79% | 65.68% | 69.08% | 68.46% | 57.05% | 74.99% | 59.47% | 50.20% | 40.17% | 46.05% | 41.86% | 59.09% | 38.20% | 49.50% | 0.00% | 71.96% | 56.55% | 41.99% | 68.32% | 70.26% |
| 26 | 18.00% | 66.83% | 27.81% | 58.97% | 60.75% | 58.93% | 53.44% | 35.93% | 46.74% | 43.42% | 64.82% | 63.48% | 60.63% | 50.49% | 61.32% | 49.77% | 45.21% | 37.48% | 43.55% | 43.97% | 53.88% | 36.17% | 42.90% | 0.00% | 56.55% | 61.30% | 48.01% | 52.84% | 56.74% |
| 27 | 25.83% | 52.19% | 23.87% | 47.50% | 43.31% | 45.70% | 41.62% | 40.01% | 39.56% | 33.41% | 48.04% | 48.78% | 46.20% | 39.09% | 43.45% | 37.72% | 34.46% | 31.80% | 31.24% | 42.61% | 41.01% | 27.96% | 37.24% | 6.06% | 41.99% | 48.01% | 50.90% | 40.15% | 42.67% |
| 28 | 14.09% | 66.16% | 28.89% | 61.85% | 67.43% | 66.70% | 59.73% | 41.24% | 47.61% | 40.81% | 60.79% | 68.67% | 70.02% | 58.77% | 73.03% | 63.08% | 53.14% | 41.36% | 51.36% | 44.20% | 60.05% | 38.41% | 48.94% | 0.00% | 68.32% | 52.84% | 40.15% | 75.01% | 69.66% |
| 29 | 14.81% | 69.88% | 29.25% | 64.65% | 69.39% | 65.43% | 59.80% | 47.39% | 49.26% | 42.44% | 63.69% | 68.15% | 68.09% | 60.31% | 76.64% | 61.53% | 52.25% | 39.01% | 48.66% | 38.44% | 59.83% | 39.98% | 47.39% | 0.00% | 70.26% | 56.74% | 42.67% | 69.66% | 72.42% |

*Source: Moody's Investors Service*

## Moody's Related Publications

Credit ratings are primarily determined through the application of sector credit rating methodologies. Certain broad methodological considerations (described in one or more cross-sector rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments. A list of sector and cross-sector credit rating methodologies can be found here.

For data summarizing the historical robustness and predictive power of credit ratings, please click here.

For further information, please refer to *Rating Symbols and Definitions*, which includes a discussion of Moody's Idealized Probabilities of Default and Expected Losses, and which is available here.

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