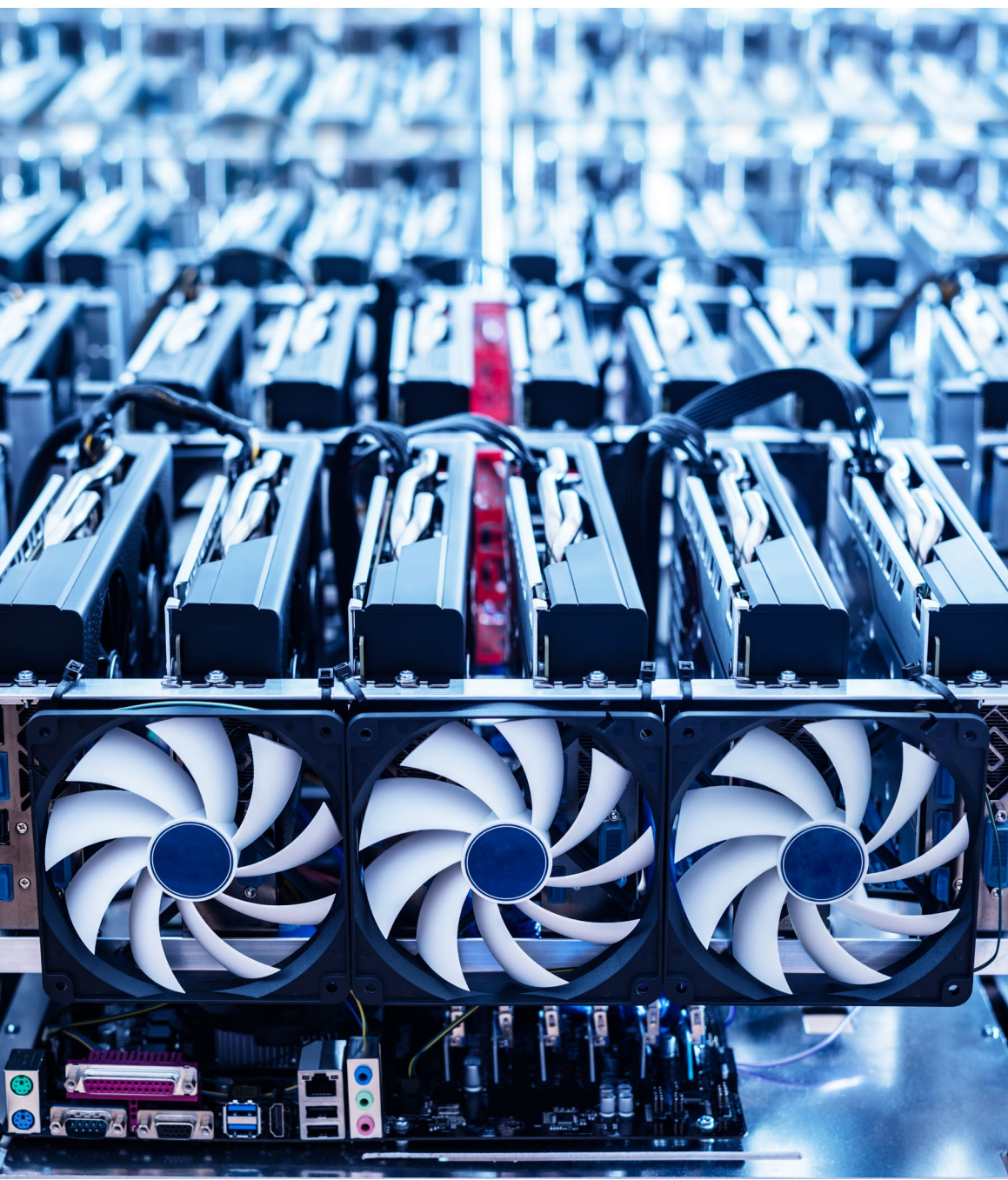


Exploring Crypto And DeFi Risks In Credit Ratings

June 30, 2022

This report does not constitute a rating action



Primary analyst

Andrew O'Neill

London
+44-20-7176-3578
andrew.oneill@spglobal.com

Secondary analysts

Alexandre Birry

London
+44-20-7176-7108
alexandre.birry@spglobal.com

Lapo Guadagnuolo

London
+44-20-7176-3507
lapo.guadagnuolo@spglobal.com

Nik Khakee

New York
+1-212-438-2473
nik.khakee@spglobal.com

Key Takeaways

- In recent months, risks relating to cryptocurrency and decentralized finance (DeFi) have emerged among some rated issuers, including traditional entities engaging with crypto in a limited way and new entities operating primarily in the space.
- The rapid emergence and lack of track record of issuers operating primarily in the crypto and DeFi space and the ecosystems in which they operate create novel and interconnected risks that weigh significantly on our ratings on these entities.
- Not all crypto assets or DeFi platforms are created equal, making a case-by-case analysis of their impact on credit risk essential.
- In addition, the key elements of the crypto ecosystem are evolving quickly, particularly regulation and emergent use cases for stablecoins and crypto assets. As in every new industry, some entities will not survive this rapid evolution, while others will become firmly established.

Crypto and DeFi risks
can weigh heavily on
our ratings

The crypto ecosystem is evolving rapidly and throwing up novel risks for the entities operating within it, whether it be relatively new companies whose primary business is crypto, or traditional firms dipping their toes in the water. The credit risks that S&P Global Ratings has seen emerge in the crypto and DeFi space in recent months include new variations on traditional risks, such as new drivers of competitive dynamics or collateral quality, and new types of third-party dependency. They also include entirely new risks, such as those relating to the convertibility of cryptocurrency into fiat currency; the interaction between a DeFi protocol's "on-chain" and "off-chain" activities--those that take place within and outside the blockchain, respectively; or the uncertain and rapidly developing regulatory environment. These risks can weigh heavily on our ratings on entities exposed to crypto, and may be crucial to their success or failure.

As we see it, the risk factors associated with the rapid evolution of the crypto ecosystem fall into eight main categories: legal and regulatory; liquidity; volatility; protocol and smart contract; blockchain and cyber; business sustainability; operational or third-party dependency; and governance and reputational (see chart 1). However, as not all crypto assets or DeFi platforms are created equal, a case-by-case analysis of their impact on credit risk is essential. After outlining the eight different categories of crypto and DeFi risk, we take a look at the risk exposure of four rated entities--Compound Prime LLC, Coinbase Global Inc., MicroStrategy Inc., El Salvador--and then illustrate the potential relevance of these risks for U.S. public finance obligors.

Chart 1

Risk Factors Associated With A Rapidly Evolving Ecosystem



These risks are:

Interconnected: Several or all will apply to a specific issuer and weigh collectively and significantly on the rating; and

Evolving: They may increase or decrease together as the asset class and its ecosystem evolve.

Source: S&P Global Ratings.

Legal and regulatory risks: Increased scrutiny could disrupt business models, while increased clarity could boost confidence and firmly establish some players

Traditional finance, for the most part, tends to operate within clear and tested legal, tax, and regulatory frameworks. In contrast, the nascent crypto and DeFi sectors lack specific legislation or legal precedents. This can create uncertainty around the core legal concepts of financial instruments, sparking a need to analyze them on a case-by-case basis. Examples include the enforceability of collateral arrangements, tax implications, and the isolation of the reserve assets backing a stablecoin--a cryptocurrency whose market value typically references a fiat currency--in the event of the stablecoin issuer's insolvency.

We expect the crypto space to attract increasing regulatory scrutiny, with significant differences between regulators across jurisdictions in terms of their preparedness and attitude toward crypto, and newly emerging regulatory, tax, and reporting requirements for cryptocurrencies. For rated issuers engaged in crypto-related activities, increased regulatory scrutiny can present both risks and opportunities. Certain entities may become regulated themselves, whereas others may be affected indirectly through the regulation of the stablecoins or crypto assets they are exposed

Exploring Crypto And DeFi Risks In Credit Ratings

to. On the one hand, more intrusive regulation may disrupt business models and slow growth. On the other hand, it may allow entities with a stronger and more proactive approach to regulation to become more established. Greater regulatory clarity may also boost confidence in the crypto ecosystem.

Liquidity risk: An entity may not be able to monetize sufficient crypto assets to make timely debt payments

We view some stablecoins differently from other crypto assets in analyzing an entity's liquidity risk. We assess stablecoins' availability to meet liquidity needs on a case-by-case basis, and may apply a haircut to the value of, or otherwise restrict giving credit to, stablecoin holdings to capture the risks relating to their timely availability. Even the most established stablecoins backed by fiat reserves are exposed to convertibility risk. If confidence in a stablecoin wanes or their (private company) issuer becomes insolvent, it may be difficult to redeem the stablecoin for fiat currency without a loss or delay (see "Stablecoins: Common Promises, Diverging Outcomes," published June 15, 2022). To date, we have only assessed the U.S. dollar coin (USDC) in the context of the Compound Prime and Coinbase examples below. Our approach may evolve for individual stablecoins along with regulatory developments.

For other crypto asset types, although some may have a track record of material trading volumes on a multitude of exchanges, they have yet to demonstrate this through a genuine liquidity crunch in the crypto markets, and price volatility precludes the reliance on such holdings for liquidity purposes. Moreover, some crypto assets are illiquid and traditional asset-to-liability mismatch risks exist, particularly for centralized entities that invest customers' crypto deposits.

Celsius: An Example Of Crypto Asset-To-Liability Mismatch Risk

Celsius, a centralized crypto lender, halted customer withdrawals on June 13, 2022, due to liquidity concerns. While we do not rate Celsius, we understand that one key driver of the liquidity concerns was asset-to-liability mismatch risk. Celsius staked a material portion of customers' Ether (ETH) deposits through Lido, a DeFi platform. Staked ETH are used to validate software as part of the Ethereum blockchain's planned move to proof-of-stake validation. Stakers earn a yield on staked assets, but generally cannot withdraw these assets immediately. (Staked ETH withdrawals will not be possible until sometime after the Ethereum blockchain moves to proof of stake, which is due to occur later in 2022.) By staking ETH through the Lido platform, Celsius received stETH tokens in exchange, a representation of the ETH staked through Lido on the Ethereum blockchain. These stETH tokens can be traded or used as collateral on DeFi platforms, and, prior to the recent downturn, their value remained closely pegged to the value of ETH. However, the value of stETH dropped below its peg, and it seems that insufficient liquidity in the stETH tokens put Celsius' ability to meet customer ETH withdrawals at risk.

Volatility risk: Market price fluctuations may affect an entity's revenues or lead to losses on its asset holdings

There is a significant risk of losses on an entity's crypto asset holdings due to market volatility, and again, this risk varies between crypto assets. The nascent ecosystem has a relatively short track record, with assets at different stages of adoption in the market and volatility cycles that are somewhat dissociated from conditions in the traditional financial markets.

Exploring Crypto And DeFi Risks In Credit Ratings

Some stablecoins, backed by fiat reserves, have established, and, to date, maintained, their value relatively close to their targeted peg to the relevant fiat currency, albeit with greater volatility than fiat currencies pegged to the U.S. dollar, for example. There is a risk of more frequent and larger peg breaches if confidence in individual stablecoins wanes. This risk would increase if the stablecoin issuers struggled to maintain sufficient fiat reserves, for instance if large redemptions occurred while the value of longer-dated reserve assets was declining in an environment of rising interest rates. There is a further risk of losses if the stablecoin issuer becomes insolvent. We consider both an entity's credit risk exposure to the stablecoin issuer and the volatility of the underlying reserve assets in our loss assumptions on stablecoins.

We have not yet set any loss assumptions on other types of stablecoins, particularly those issued by a decentralized autonomous organization (DAO), or those where the peg to a fiat currency is backed only by an algorithm, rather than by fiat reserves. Our key considerations in setting any loss assumptions would include the strength of any available reserves and of the protocol's governance. DAI is one example of a DAO-issued stablecoin that is overcollateralized by crypto assets and that has, to date, maintained its value relatively close to its peg to the U.S. dollar. However, the short track records of these stablecoins warrant caution. Two recent examples of uncollateralized stablecoins collapsing in value illustrate potential risks: Terra, a U.S.-dollar pegged stablecoin backed by an algorithm (and, partially, by a recently initiated reserve of bitcoin); and Beanstalk, where the collapse resulted from a sudden lack of confidence due to a hack on the associated governance token.

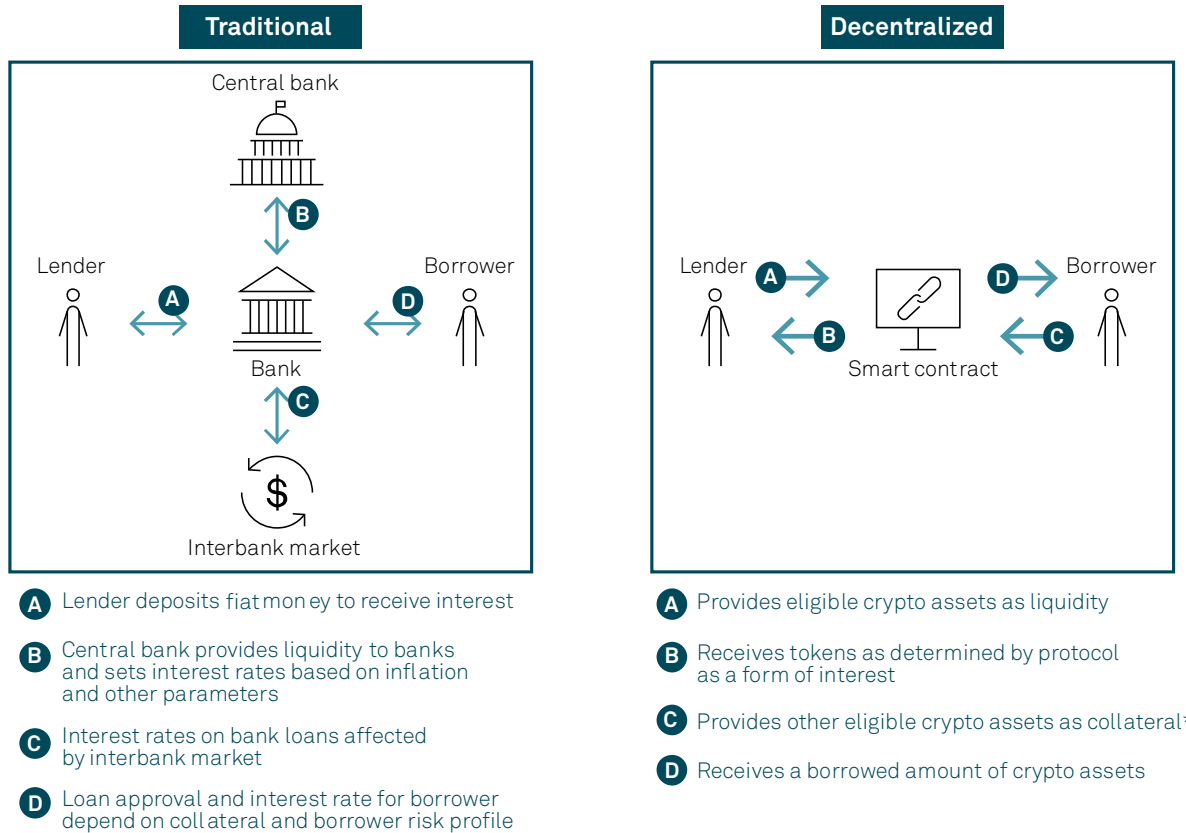
For other crypto asset types, significant price volatility precludes the calibration of generalized market-value haircut assumptions that could apply in the absence of mitigating factors. On the one hand, if an entity only holds crypto assets and is fully exposed to the risk of volatility in their market value, so far, we have not given any quantitative consideration to these assets (see the section on MicroStrategy below). On the other hand, if an entity provides fiat or stablecoin loans that are overcollateralized by crypto assets, we have given some credit to the crypto collateral in determining our loss assumptions on such loans where the entity's exposure to the volatility risk of the crypto assets is mitigated. For example, in our rating on Compound Prime, mitigants to volatility risk include restrictions on the types of crypto assets eligible as collateral; minimum loan overcollateralization thresholds associated with the crypto asset provided as collateral; and a liquidation mechanism that is triggered on the breach of these thresholds, thereby limiting the exposure to volatility risk.

Protocol / smart contract risk: Smart contracts are easily replicable, heightening competitive risks, while weaknesses in code create risks of hacks or unintended consequences

Smart contracts are programs stored on a blockchain and executed by any party, contingent on logic specified in the smart contract and data stored on the blockchain. Smart contracts govern DeFi protocols (see chart 2). They are open source and therefore easily replicable, lowering barriers to entry and heightening competitive risks. They provide transparency and certainty for all parties involved, although the irreversible nature of blockchain entries also brings its own set of risks. Any weaknesses in the coding of smart contracts could lead to unintended consequences, or be exploited by hackers. Smart contract audits by reputable auditing firms provide some mitigation, but the short track records and rapid growth of DeFi protocols mean that vulnerabilities may emerge as they scale up and operate in different market environments. A lack of audits has been a significant factor in the most recent significant DeFi protocol hacks and exploits, but audits have not eliminated the risk (see chart 3).

Chart 2

DeFi Uses Smart Contracts In Place Of Conventional Financial Risk Functions



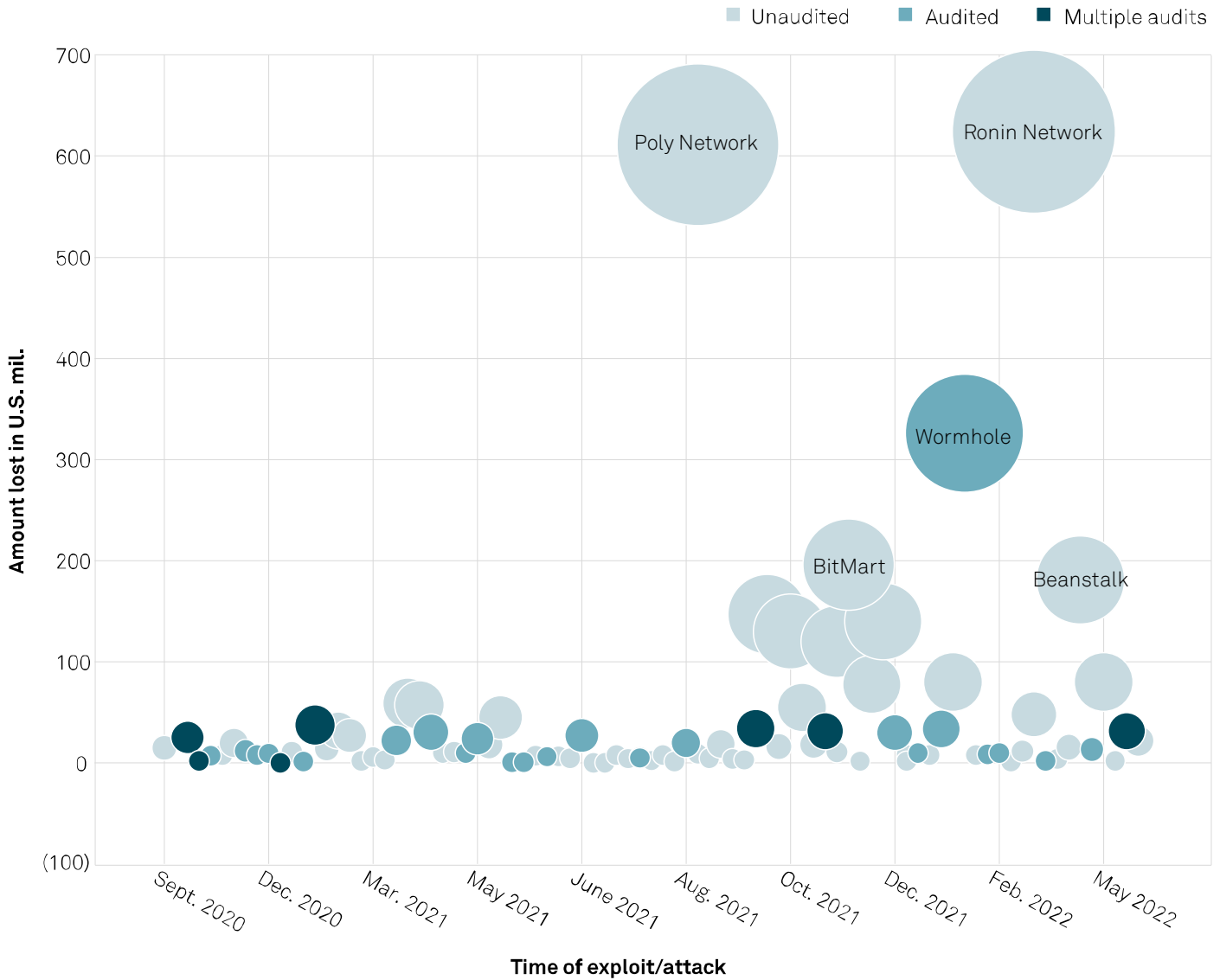
*Most DeFi borrowing solutions require an overcollateralization based on a collateral factor. A few solutions offer unsecured borrowing. Source: S&P Global Ratings.

The functioning of smart contracts on a blockchain often requires an input feed of external off-chain information (for example, pricing data to monitor collateralization ratios on a lending protocol). Off-chain information is provided by entities referred to as "oracles". Oracle risk arises when the information feed provided by the oracle is inaccurate, manipulated, or interrupted. This can materially disrupt the functioning of a smart contract and the DeFi protocol it supports.

Chart 3

Documented Timeline Of DeFi Protocol Exploits And Exchange Hacks

Sept. 3, 2020 - June 2, 2022



Bubble size represents the amount lost. Top five DeFi hacks named. Source: rekt.news.

Blockchain and cyber risk: The newer the blockchain, the greater the cyber risk

Blockchain is often cited as a security control option to avoid malware and distributed denial-of-service attacks, but using blockchain also introduces administrative, operational, legal, and regulatory risks (see "Cyber Brief: Reviewing The Credit Aspects Of Blockchain," published May 5, 2022). For the most established blockchains, such as the Bitcoin or Ethereum blockchains, relatively long security track records indicate lower risk. Conversely, an entity operating on a new and untested blockchain may be exposed to greater cyber risks.

For DeFi protocols, and entities operating with a blockchain, off-chain activities (such as interactions with oracles) increase their exposure to cyber risk. An off-chain activity may not have the same protections as an on-chain activity and malicious actors could hack vulnerable access

Exploring Crypto And DeFi Risks In Credit Ratings

points through an oracle to manipulate the contract. Cyber protocols must be maintained to mitigate this oracle risk.

Business sustainability risk: The viability of business models is a key focus in our analysis of entities focused on crypto

While cryptocurrency has been in existence for more than a decade, use cases and associated business models are emergent and their medium- to long-term viability is therefore uncertain. Thus far, crypto companies' and DeFi activities have mostly related to speculation and venture capital, as well as allowing existing cryptocurrency holders to monetize their assets, with limited crossover into the real economy. As interactions with the real economy develop, some use cases may emerge as more sustainable.

Cryptocurrency exchanges and DeFi lenders rely on transaction-based revenues, and demand for their services may rise or fall based on overall crypto market prices. If an entity's activity is tied to a specific asset, such as in the case of a cryptocurrency mining company, its success or failure may rest substantially on whether that specific cryptocurrency achieves meaningful adoption.

Competitive pressures are particularly significant for DeFi entities, as the open-source nature of DeFi protocols lowers barriers to entry. In order to boost the use of a particular crypto asset or DeFi protocol, entities may offer initial pricing that is not sustainable in the long term. Rapid innovation also creates new forms of competition. For example, to date, most DeFi lending has been supported purely by the crypto collateral that borrowers provide, without any assessment of borrower default risk. New approaches involving an assessment of borrower default risk may offer attractive alternatives for some borrowers.

Operational risk / third-party dependencies: Reliance on third parties can introduce new risk exposures

Entities may be exposed to the credit risk of a custodian holding their crypto assets, or the operational risk of a third party holding the keys to their crypto wallets. Furthermore, an entity holding stablecoin may be exposed to either the credit risk of the coin issuer, or the operational risk of an exchange that it uses to convert stablecoin into fiat currency and vice versa. Even in DeFi, the reliance on third-party service providers is significant: protocols rely on platform participants to perform specific roles, such as liquidating undercollateralized positions; auditors to verify the integrity of smart contracts; and oracles to provide the pricing information necessary for monitoring the collateralization ratios. Often, these service providers are unrated, hence we have no view into their ability to provide services over the horizon of a debt rating. As the providers are also unregulated, we have no view into the likelihood of regulators ensuring their continued ability to provide services. Finally, their value proposition is often that they are uniquely qualified to do what they do, which may mean they are irreplaceable in the event of a service disruption. The combination of these factors is likely to weigh on ratings.

Governance/reputational risk: A DeFi protocol governed by a DAO has a radically different risk profile to that of centralized entities

Our key considerations in assessing governance risk for a DAO include:

- Whether there is concentration among the holders of governance tokens;
- Whether the benefits accruing to these holders incentivize the safeguarding of the protocol; and
- What the process is to make changes to the protocol, as the need to vote on any change can limit the ability to respond rapidly to a crisis.

Exploring Crypto And DeFi Risks In Credit Ratings

For centralized entities, reputational risks include the potential fallout from offering retail customers specific crypto assets that collapse in value, and any association with criminal activity in cases where anti-money laundering or know-your-customer requirements are weak or absent.

Selected Rated Entities And Their Exposure To Crypto And DeFi Risks

Rated entities are exposed to different types of crypto and DeFi risk and to varying degrees. Compound Prime and Coinbase, for example, operate largely in the crypto space, while MicroStrategy and El Salvador have taken on, or intend to take on, material crypto risks. MicroStrategy is a business analytics company with a material holding of bitcoin, and El Salvador a sovereign that has authorized bitcoin as an alternative legal tender (along with the U.S. dollar) and announced its intention to issue debt to purchase bitcoin. Liquidity and funding, volatility, and governance and reputational risk affect all four entities, whereas the other risks are issues for some and not others (see table 1). Crypto-related risks are the primary drivers of our current ratings on Compound Prime and Coinbase, whereas they are supplemental to the more traditional credit risks that drive our ratings on MicroStrategy and El Salvador.

Table 1

Rated Entities' Varying Exposure To Crypto Risk

Risk	Compound Prime	Coinbase	MicroStrategy	El Salvador
Business sustainability risk	Y	Y	N	N
Regulatory risks and opportunities	Y	Y	N	Y
Liquidity/funding risk	Y	Y	Y	Y
Volatility risk	Y	Y	Y	Y
Protocol/smart contract risk	Y	N	N	N
Blockchain and cyber risk	Y	Y	N	N
Operational risk/third-party dependencies	Y	N	N	N
Governance/reputational risk	Y	Y	Y	Y

S&P Global Ratings.

Compound Prime: An Entity Lending Debt Proceeds Into A DeFi Protocol

Compound Prime is a California-based company, launched in 2021, that promises a fixed interest rate to accredited investors for one year by lending out customers' funds onto the Compound Protocol--a blockchain-based decentralized finance platform.

Compound Prime's major rating weaknesses include, in our view, the challenges it faces in generating the 4% return it has promised to investors for the initial term in a volatile cryptocurrency market that is currently in a downturn, and with a very low capital base. Other weaknesses are the regulatory risk associated with cryptocurrencies; Compound Prime's considerable operational risk and complexity; and the convertibility risk between private stablecoins and fiat currency. We expect limited loan losses on the platform given the short time exposure to volatility in the cryptocurrency value (12-15 seconds), but also very low profitability and a fast-expanding balance sheet, which will weigh on Compound Prime's already weak capital position.

Debt proceeds are denominated in either fiat U.S. dollars or digital USDC, a stablecoin managed by private third-party company Circle, which is a key member of the Centre Consortium and

Exploring Crypto And DeFi Risks In Credit Ratings

authorized to mint and redeem USDC. The fiat portion of the debt proceeds is converted into USDC. The conversion from fiat currency to USDC is necessary because fiat currency cannot interact directly with a blockchain protocol. Subsequently, the USDC is contractually supplied onto the Compound platform, where it is lent out to USDC borrowers against crypto (digital assets) collateral. To meet investor redemptions, USDC is withdrawn from the Compound platform. For fiat redemptions, USDC is then converted back into U.S. dollars in several operational steps involving external counterparties, thereby creating an additional layer of risk.

Related Publications

- Bulletin: Compound Prime LLC Risk Profile Remains Consistent With Our Initial Expectations, Despite Large Crypto Price Corrections, June 15, 2022
- Research Update: Compound Prime Assigned 'B-' Ratings On Weak Capital Base, Regulatory Risk, And Profitability Challenges; Outlook Stable, May 9, 2022

Analytical Contacts

- Michal Selbka - michal.selbka@spglobal.com
- Nicholas Wetzel - nicholas.wetzel@spglobal.com
- Thierry Grunspan - thierry.grunspan@spglobal.com

Table 2

CompoundPrime's Crypto/DeFi Risk Factors

Crypto/DeFi risk factor	Entity characteristics
Business sustainability risk	Earnings on the Compound Protocol are based on a volatile USDC supply rate, which may be insufficient to pay the fixed rate to Compound Prime's investors, currently set at 4%.
Regulatory risks and opportunities	<p>We view regulatory risk as significant for the rating, given the considerable uncertainty about the evolving regulatory approach to cryptocurrencies. Compound Prime is not subject to regulatory supervision, but we cannot rule out the risk that it could be in future, and this could have a substantial impact on its business model.</p> <p>Areas of regulation could include capital or liquidity requirements, leverage, types of investor, eligible cryptocurrencies that it can invest in, and lending or know-your-customer practices.</p>
Liquidity risk	The key risk, in our view, relates to the fact that Compound Prime promises redemption of debt securities within 24 hours of a working week. This promise relies entirely on the functioning and swift conversion of stablecoin back into U.S. dollars by Circle. Circle's U.S. dollar reserves backing the USDC in circulation on a one-to-one basis are segregated from the issuer and available, in theory, if Circle defaults. While in principle this may mean that USDC investors could eventually get their money back, it may continue to pose risks in terms of timely repayment.
Volatility risk	<p>In our capital analysis (see "Risk-Adjusted Capital Framework Methodology," published Sept. 13, 2018), we apply a 250% risk weight to holdings of USDC equivalent to a capital charge of 20%. This considers the credit risk exposure to Circle as the private company issuer of USDC; the volatility of the fiat reserve assets backing USDC; and the mitigation provided by the monthly third-party audits of these reserve assets.</p> <p>We also apply a 250% risk weight / 20% capital charge to Compound Prime's USDC loans backed by crypto collateral. This considers the volatility of the crypto collateral, as well as the following mitigating factors: eligibility restrictions on collateral types; maximum loan-to-value (LTV) thresholds, with loans generally well below the maximum threshold; and revaluation of the collateral every 12-15 seconds, with automatic liquidation if the LTV threshold is breached.</p> <p>We deduct the value of non-stablecoin crypto asset holdings (primarily COMP tokens, the governance token associated with the Compound Protocol) from total adjusted capital, meaning we give no benefit to these tokens in our capital analysis, reflecting the fact that they are not backed by any collateral.</p>

Exploring Crypto And DeFi Risks In Credit Ratings

Protocol/smart contract risk	In October 2021, a bug in the protocol code caused the unintended distribution of large amounts of the COMP governance token.
Blockchain and cyber risks	The Compound Protocol is built on the Ethereum blockchain. Any significant risk events at any of Compound Prime's network counterparties, which all have relatively limited track records, could have a critical impact on Compound Prime's business.
Operational risk / third-party dependencies	Compound Prime has separate external custody partners for its U.S. dollar and USDC holdings or payment streams. It relies fully on Circle for the convertibility of USDC to fiat. The direct supply of USDC to and from the protocol is managed by Fireblocks, a digital asset custody, transfer, and settlement platform. Oracles value the crypto collateral. Liquidators of collateral on loans that breach LTV thresholds are incentivized through the economics of the protocol. Gauntlet, a financial modelling platform, provides risk advisory services to the protocol, supporting the calibration of collateralization thresholds.
Governance/reputational risk	The need to vote on any change can limit the ability to respond rapidly to a crisis, for example, by adjusting the collateralization thresholds for specific crypto assets. For example, in October 2021, the implementation of a fix of the vulnerability in the protocol that caused the unintended distribution of COMP tokens required a governance proposal that took a week to pass.

Coinbase: A Centralized Crypto Exchange

Coinbase is a provider of end-to-end financial infrastructure and technology for the cryptoeconomy. Its platform enables the buying and selling of crypto assets for retail and institutional customers while serving as a custodian for crypto assets. It is a member of the Centre Consortium, along with Circle.

We regard Coinbase's very low leverage, strong liquidity, solid market share of crypto assets on its platform, and strong track record of avoiding security breaches since inception as rating strengths. These are balanced by Coinbase's reliance on retail transaction revenue, elevated volatility in the asset class, and competitive risk in a nascent asset class from centralized and decentralized cryptocurrency exchanges, financial technology, and brokerage firms.

There are three key crypto-ecosystem factors underlying the rating on Coinbase. First, the entity derives revenue from trading activity, and is therefore affected by trading volumes rather than by price fluctuations directly. We would see rising downside risks to the rating if a prolonged chill in the crypto markets were to extend throughout 2023 and gradually eat into the company's sizable cash cushion, translating into higher leverage and weaker financial risk. Second, Coinbase is at the lowest end of the peer group ratings, reflecting the nascent status of the asset class. Third, the use case is not tied to any one cryptocurrency or to the valuation of cryptocurrencies.

Related Publications

- Research Update: Coinbase Outlook Revised To Negative On Earnings Pressure And Expected Lower Excess Cash Position; Ratings Affirmed, June 16, 2022
- Research Update: Coinbase Global Inc. Assigned 'BB+' Rating; Outlook Stable, Sept. 13, 2021

Analytical Contacts

- Prateek Nanda - prateek.nanda@spglobal.com
- Thierry Grunspan - thierry.grunspan@spglobal.com

Table 3

Coinbase's Crypto/DeFi Risk Factors

Crypto/DeFi risk factor	Entity characteristics
Business sustainability risk	There is a risk of competition in a nascent asset class from centralized and decentralized cryptocurrency exchanges, financial technology, and brokerage firms.
Regulatory risks and opportunities	<p>Coinbase takes a proactive approach to regulatory compliance and has strong operational controls, which we view as a competitive advantage.</p> <p>Our base case presumes greater regulatory scrutiny of the crypto sector. On balance, this is likely to be manageable for Coinbase, but we acknowledge that regulation is evolving and somewhat uncertain. More intrusive regulation could slow growth, for example by limiting the range of products Coinbase can list on its platforms or by capping the expansion of its lending program to retail customers. However, more regulation could create a safer environment and attract more participants to regulated exchanges like Coinbase.</p>
Liquidity risk	We do not treat crypto assets as cash and cash equivalents because of the significant volatility in the prices of these assets.
Volatility risk	<p>Coinbase's exposure to cryptocurrencies is diversified (that is, its activities do not focus on a single crypto asset) and primarily arises through transaction revenues, which are generated when assets are both increasing or decreasing in value.</p> <p>Volatility in earnings occurs due to a variation in crypto asset trading volumes rather than being directly due to price fluctuations.</p> <p>Lending is backed by crypto assets, where volatility risk is mitigated by a maximum LTV and margin calls.</p>
Protocol/smart contract risk	Not a material consideration.
Blockchain and cyber risks	<p>Coinbase has a strong track record of securing assets safely through its cold storage custody solutions, with only a small percentage of customer crypto assets held in "hot wallets".</p> <p>To mitigate the risk of a hot wallet breach, the company has strong cyber-risk safeguards, an insurance policy, and maintains inventories of crypto assets on its balance sheet that could be used to indemnify clients.</p> <p>Coinbase has a relatively short track record of operating at high volumes and avoiding security breaches at elevated volume levels.</p>
Operational risk / third-party dependencies	Not a material consideration.
Governance/reputational risk	Reputational risk arises from the selection of an asset for trading on the exchange that then collapses in value.

MicroStrategy: A Corporate Entity With A Material Holding Of Bitcoin

MicroStrategy is an enterprise analytics and business intelligence software provider with a significant holding of bitcoin. MicroStrategy has a good recurring revenue base and low interest expenses on its convertible debt, which will allow it to maintain good EBITDA interest coverage and generate positive free operating cash flow. We expect these factors to enable the company to sustain its operating results and capital structure over the subsequent 12 months.

In 2021, MicroStrategy issued approximately \$500 million of senior secured notes and used the proceeds to purchase additional bitcoin. Given MicroStrategy's low interest expenses, the residual primary credit risk is the value of bitcoin and MicroStrategy's ability to refinance its debt. A failure to refinance would result in a likely need to liquidate the bitcoin to repay the debt.

A key driver of our rating on MicroStrategy is our treatment of its crypto assets relative to its leverage. We do not treat crypto assets as cash and cash equivalents because of the significant volatility in the prices of these assets.

Related Publication

- MicroStrategy Inc. Assigned 'CCC+' ICR On Leveraged Bitcoin Purchase, Outlook Stable; Debt Rated 'B-' (Recovery: 2), June 9, 2021

Analytical Contacts

- Neilson Lin - neilson.lin@spglobal.com
- Christian Frank - christian.frank@spglobal.com

Table 4

MicroStrategy's Crypto/DeFi Risk Factors

Crypto/DeFi risk factor	Entity characteristics
Regulatory risks and opportunities	Not a material consideration.
Liquidity risk	We do not treat bitcoin as cash and cash equivalents because of the significant price volatility. This is a key driver behind our 'CCC+' rating on MicroStrategy.
Volatility risk	The sustainability of the company's financial commitments is highly dependent on the price of a single crypto asset, bitcoin. Volatility in the value of the bitcoin holding can lead to material volatility in overall earnings.
Protocol/smart contract risk	MicroStrategy has no exposure to a DeFi protocol or to any specific smart contract risk.
Blockchain and cyber risks	This is a more marginal consideration for the rating, although the importance of bitcoin holdings to the treasury policy underpins the importance of safe storage for the company's bitcoin.
Operational risk / third-party dependencies	Not a material consideration.
Governance/reputational risk	MicroStrategy CEO's control of 72% of the company's voting rights is a negative credit factor. The range of outcomes stemming from this concentration of voting rights includes those that are negative for MicroStrategy's credit quality, such as its decision to pursue leveraged bitcoin purchases.

El Salvador: A Sovereign Adopting Bitcoin As Legal Tender

Our 'CCC+' sovereign rating on El Salvador primarily reflects traditional credit factors, namely low per capita income, lackluster economic growth, monetary rigidities stemming from dollarization, high debt, and fiscal deficits. However, the country's adoption of bitcoin as an alternative legal tender in September 2021 and the announced intention to issue debt to purchase bitcoin could introduce several nontraditional credit risks.

El Salvador has used the U.S. dollar as its main currency since 2001, but recently adopted bitcoin as a second legal tender in an attempt to increase financial inclusion, as more than 60% of the population is unbanked. To this end, the government created a crypto wallet (Chivo) and established a \$150 million trust fund to secure the immediate convertibility between bitcoin and U.S. dollars at the spot price.

Related Publication

- El Salvador's Bitcoin Case: High Risks Will Limit Benefits, Sept. 16, 2021

Analytical Contacts

- Patricio Vimberg - patricio.vimberg@spglobal.com
- Elijah Oliveros-Rosen - elijah.oliveros@spglobal.com
- Ravi Bhatia - ravi.bhatia@spglobal.com

Table 5

El Salvador's Crypto/DeFi Risk Factors

Crypto/DeFi risk factor	Entity characteristics
Regulatory risks and opportunities	In the absence of effective anti-money-laundering and other measures that combat the financing of illicit activities, the adoption of bitcoin could facilitate these activities, contribute to tax evasion, and pose a risk to the country's financial system and its relationship with other countries and multilateral organizations. The so-called Bitcoin Law was proposed in July 2021 and swiftly approved in September 2021.
Funding risk	The adoption of bitcoin increases fiscal vulnerabilities if it becomes widely used. Allowing taxes to be paid in either U.S. dollars or bitcoin reduces visibility over the future trajectory of fiscal revenue.
Volatility risk	The government's decision to buy and hold bitcoin could deepen fiscal weaknesses. We see potential disruption to credit from domestic banks if bitcoin is widely used. Assuming banks continue to supply loans in U.S. dollars but are forced to accept payments and deposits in bitcoin, vulnerabilities relating to a balance sheet currency mismatch could arise. Although banks have conservatively avoided any balance sheet exposure to bitcoin so far, they may face increased hedging costs, or act to reduce their exposure to that risk by reducing lending.
Protocol/smart contract risk	El Salvador has no exposure to a DeFi protocol or to any specific smart contract risk.
Blockchain and cyber risks	This is a marginal consideration for the rating, although the government's plans to issue debt to purchase bitcoin highlight the importance of a safe storage approach. There are also cyber risks related to the government-run Chivo wallet.
Operational risk / third-party dependencies	El Salvador faces a potential future dependency on a custodian holding large balances of bitcoin if it acquires these, depending on the storage approach.
Governance/reputational risk	Bitcoin adoption threatens El Salvador's International Monetary Fund (IMF) deal. The government has been negotiating a \$1.3 billion IMF loan for around two years. Bitcoin's potential lowering of El Salvador's financial integrity by indirectly encouraging illicit financial activities such as money laundering and tax evasion could complicate the ongoing negotiations.

Crypto-Related Risks For U.S. Public Finance Obligors

U.S. public finance issuers are showing an increasing interest in blockchain and cryptocurrency as a new investment tool to enhance portfolio diversification, earn higher returns, and increase the efficiency of operations to control costs. Crypto-related credit risks have remained a marginal consideration in ratings to date, but could increase in relevance for some issuers.

Related Publications

- U.S. Public Finance: Cryptocurrencies May Boost Revenue--But Are Not Without Risk, Sept. 16, 2021
- Cryptocurrency: U.S. Public Finance Issuers Cautiously Consider Its Applications, Sept. 15, 2021

Analytical Contacts

- Todd Kanaster - todd.kanaster@spglobal.com
- Geoff Buswick - geoff.buswick@spglobal.com

Table 6

U.S. Public Finance Obligors' Crypto/DeFi Risk Factors

Crypto/DeFi risk factor	Entity characteristics
Regulatory risks and opportunities	As the industry develops further, the landscape will become more competitive. States could compete for crypto-mining operations, financial services, and even depository institutions, resulting in the need for legislation and/or regulation. If governments manage their own cryptocurrency holdings, unstable cryptocurrency prices could increase volatility in the local economy and in tax revenues.
Liquidity risk	Not a current government obligor consideration because a third-party absorbs the risk.
Volatility risk	Not a current government obligor consideration because a third-party absorbs the risk. In a case where a government holds cryptocurrencies, the high volatility of the cash-out value could affect credit through reduced budgetary stability.
Protocol/smart contract risk	Not a current government obligor consideration. Interaction with smart contracts would introduce the risks associated with code weaknesses and the cyber vulnerabilities we discuss above.
Blockchain and cyber risks	This is a marginal consideration for the rating, although the government's plans to issue debt to purchase bitcoin highlight the importance of a safe storage approach. There are also cyber risks related to the government-run Chivo wallet.
Third-party dependencies	Sufficient internal or external cyber controls would demonstrate management aptitude, which we view as an integral part of cryptocurrency ownership.
Governance/reputational risk	A government's successful implementation of a legal cryptocurrency framework and its reputation as being friendly to the new industry could boost revenue through the expansion of a new job market or investment gains and result in credit-positive growth. The credit effects of crypto ownership are tied to multiple layers of cyber defense, for example, operational controls, financial security, and reputational risk. Risks can, however, be mitigated through policies and intermediaries.

Related Research

- Stablecoins: Common Promises, Diverging Outcomes, June 16, 2022
- Cyber Brief: Reviewing The Credit Aspects Of Blockchain, May 5, 2022
- Digitalization Of Markets: Framing The Emerging Ecosystem, Sept. 16, 2021
- U.S. Public Finance: Cryptocurrencies May Boost Revenue--But Are Not Without Risk, Sept. 16, 2021
- Cryptocurrency: U.S. Public Finance Issuers Cautiously Consider Its Applications, Sept. 15, 2021

Exploring Crypto And DeFi Risks In Credit Ratings

Copyright 2022 © by Standard & Poor's Financial Services LLC. All rights reserved.

No content (including ratings, credit-related analyses and data, valuations, model, software or other application or output therefrom) or any part thereof (Content) may be modified, reverse engineered, reproduced or distributed in any form by any means, or stored in a database or retrieval system, without the prior written permission of Standard & Poor's Financial Services LLC or its affiliates (collectively, S&P). The Content shall not be used for any unlawful or unauthorized purposes. S&P and any third-party providers, as well as their directors, officers, shareholders, employees or agents (collectively S&P Parties) do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Parties are not responsible for any errors or omissions (negligent or otherwise), regardless of the cause, for the results obtained from the use of the Content, or for the security or maintenance of any data input by the user. The Content is provided on an "as is" basis. S&P PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE CONTENT'S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE CONTENT WILL OPERATE WITH ANY SOFTWARE OR HARDWARE CONFIGURATION. In no event shall S&P Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Content even if advised of the possibility of such damages.

Credit-related and other analyses, including ratings, and statements in the Content are statements of opinion as of the date they are expressed and not statements of fact. S&P's opinions, analyses, and rating acknowledgment decisions (described below) are not recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security. S&P assumes no obligation to update the Content following publication in any form or format. The Content should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. S&P does not act as a fiduciary or an investment advisor except where registered as such. While S&P has obtained information from sources it believes to be reliable, S&P does not perform an audit and undertakes no duty of due diligence or independent verification of any information it receives. Rating-related publications may be published for a variety of reasons that are not necessarily dependent on action by rating committees, including, but not limited to, the publication of a periodic update on a credit rating and related analyses.

To the extent that regulatory authorities allow a rating agency to acknowledge in one jurisdiction a rating issued in another jurisdiction for certain regulatory purposes, S&P reserves the right to assign, withdraw, or suspend such acknowledgement at any time and in its sole discretion. S&P Parties disclaim any duty whatsoever arising out of the assignment, withdrawal, or suspension of an acknowledgment as well as any liability for any damage alleged to have been suffered on account thereof.

S&P keeps certain activities of its business units separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain business units of S&P may have information that is not available to other S&P business units. S&P has established policies and procedures to maintain the confidentiality of certain nonpublic information received in connection with each analytical process.

S&P may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P reserves the right to disseminate its opinions and analyses. S&P's public ratings and analyses are made available on its Web sites, www.spglobal.com/ratings (free of charge) and www.ratingsdirect.com (subscription) and may be distributed through other means, including via S&P publications and third-party redistributors. Additional information about our ratings fees is available at www.spglobal.com/ratings/usratingsfees.

STANDARD & POOR'S, S&P and RATINGSDIRECT are registered trademarks of Standard & Poor's Financial Services LLC.