

# INFRASTRUCTURE ASSET-BACKED SECURITIES

OUTPERFORMANCE IN A  
TUMULTUOUS YEAR



# Infrastructure Asset-Backed Securities: Outperformance in a Tumultuous Year

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14 April 2023

## **Part I**

### **1. Infrastructure ABS (IABS) Highlights**

#### **Introduction**

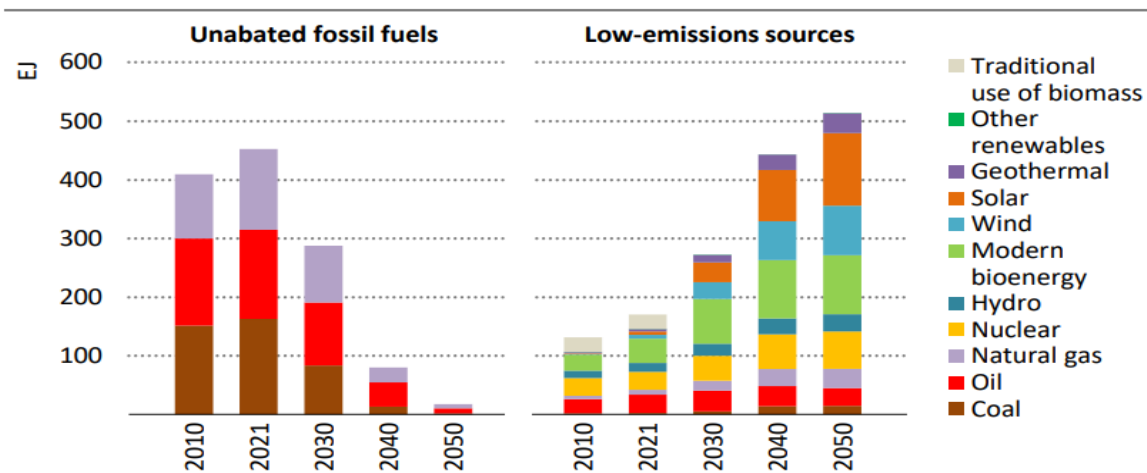
Tackling climate change is not just a moral good – it is crucial for our world’s future prosperity and security.

In 2021, the International Energy Agency (IEA) published its landmark analysis: A Roadmap for the Global Energy Sector. In 2022, IEA updated its roadmap to achieving Net Zero Emissions (NZE) and a 1.5°C increase in global average temperatures above pre-industrial levels by 2050<sup>1</sup>. The NZE Scenario is based on the deployment of a wide portfolio of clean energy technologies, with these deployment decisions hinging on costs, technology maturity, market conditions and policy preferences. The global energy landscape needs to adapt the following trends as part of the roadmap of the NZE Scenario:

- Between 2021 and 2030, low emissions sources of supply need to grow by around 125 exajoules (EJ) in the NZE Scenario, which is equivalent to the growth of world energy supply from all sources over the last fifteen years. Among low emissions sources, modern bioenergy and solar increase the most, rising by around 35 EJ and 28 EJ respectively to 2030. Over the period to 2050, however, the largest growth in low-emissions energy supply comes from solar and wind. By 2050, unabated fossil fuels for energy uses account for just 5% of total energy supply: adding fossil fuels used with CCUS (carbon capture, utilisation and storage) and for non-energy uses raises this to slightly less than 20%.

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<sup>1</sup> Source: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>



IEA. CC BY 4.0.

**A profound change in global energy supply underpins the NZE Scenario, with low-emissions sources increasing by around 125 EJ by 2030**

Notes: Unabated fossil fuels are those used for energy purposes without CCUS. Low-emissions fossil fuel sources are those equipped with CCUS or those for non-energy uses. Hydrogen and hydrogen-based fuels are not shown directly in this figure as these are not primary sources of energy supply.

- In the NZE Scenario, electricity becomes the new linchpin of the global energy system, providing more than half of total final consumption and two-thirds of useful energy by 2050. Total electricity generation grows by 3.3% per year to 2050, which is faster than the global rate of economic growth across the period. Annual capacity additions of all renewables quadruple from 290 GW in 2021 to around 1,200 GW in 2030. With renewables reaching over 60% of total generation in 2030, no new unabated coal-fired plants are needed.
- A large increase in investment in clean energy is required. Energy investment accounted for just over 2% of global GDP annually between 2017 and 2021, and this rises to nearly 4% by 2030 in the NZE Scenario. Electricity generation from renewables sees one of the largest increases, rising from \$390 billion in recent years to \$1.3 trillion by 2030. This level of spending in 2030 is equal to the highest level ever spent on fossil fuel supply (in 2014).

Getting on track for the NZE scenario will require a tripling in spending on clean energy and related infrastructure to 2030, with a bias towards much higher investment in emerging market and developing economies, which still rely heavily on higher emissions sources of energy supply such as coal.

### The Role of Securitisation

Securitisation can certainly play a role here – it can facilitate the mobilisation of institutional capital into infrastructure financing, particularly the financing of sustainable infrastructure and clean energy projects. It can also assist banks to recycle their balance sheets into originating loans to finance new infrastructure projects.

One such example is the infrastructure asset-backed securities (IABS) asset class. This entails the securitisation of project and infrastructure debt into rated, listed and tradeable fixed income instruments. Bayfront Infrastructure Management developed the first-ever IABS issuance in 2018 through Bayfront Infrastructure Capital, and this was followed by the world's first ever publicly issued securitised sustainability notes issued by Bayfront Infrastructure Capital II in 2021, which were listed on the Singapore Exchange. In 2022, another dedicated sustainability tranche issued by Bayfront Infrastructure Capital III was successfully placed, highlighting the potential for securitisation to realise its potential for financing a green transition.

To read our previous feature on Bayfront's IABS programme, please click [here](#).

### **Overview of the Sponsor: Bayfront Infrastructure Management**

Bayfront Infrastructure Management Pte. Ltd. ("Bayfront") was established in Singapore in November 2019 to help mobilise institutional capital for infrastructure financing primarily in the Asia-Pacific region.

Mission:

- To address the infrastructure financing gap in the Asia-Pacific region by facilitating the mobilisation of private institutional capital into the infrastructure financing market through IABS.
- To help unlock more capacity for infrastructure financing by banks, who have traditionally been the largest lenders in this sector, by allowing them to recycle their capital and liquidity through selling their loans to Bayfront.
- Championing Singapore as Asia's leading infrastructure financing hub

Shareholders – 70% owned by Clifford Capital Holdings Pte. Ltd. ("CCH") and 30% owned by the Asian Infrastructure Investment Bank ("AIIB") (AAA/Aaa/AAA rating). The shareholders of CCH comprise Temasek Holdings, the Asian Development Bank, Prudential Assurance Company Singapore, Standard Chartered Bank, Sumitomo Mitsui Banking Corporation, DBS Bank and Manulife.

Bayfront's funding sources:

- Equity: CCH and AIIB
- Debt: Borrowing is backed by the Government of Singapore, which provides a 10-year guarantee of up to \$2bn in debt capacity – Bayfront reports its key financial ratios and portfolio performance on a quarterly basis to the Government of Singapore

### **About the Author**

#### **Poh-Heng Tan, CFA**

Before setting up CLO Research Group, Poh-Heng worked at the Blackstone Group from July 2008 to March 2019, where he served as a portfolio manager (SMAs) and trader of global Collateralised Loan Obligation (CLO) securities. Poh-Heng was also involved with the analysis of U.S. and European CLOs, including performing

diligence on CLO managers, as well as analysing underlying portfolios and CLO structures. He also sat on the Global Structured Credit Investment Committee.

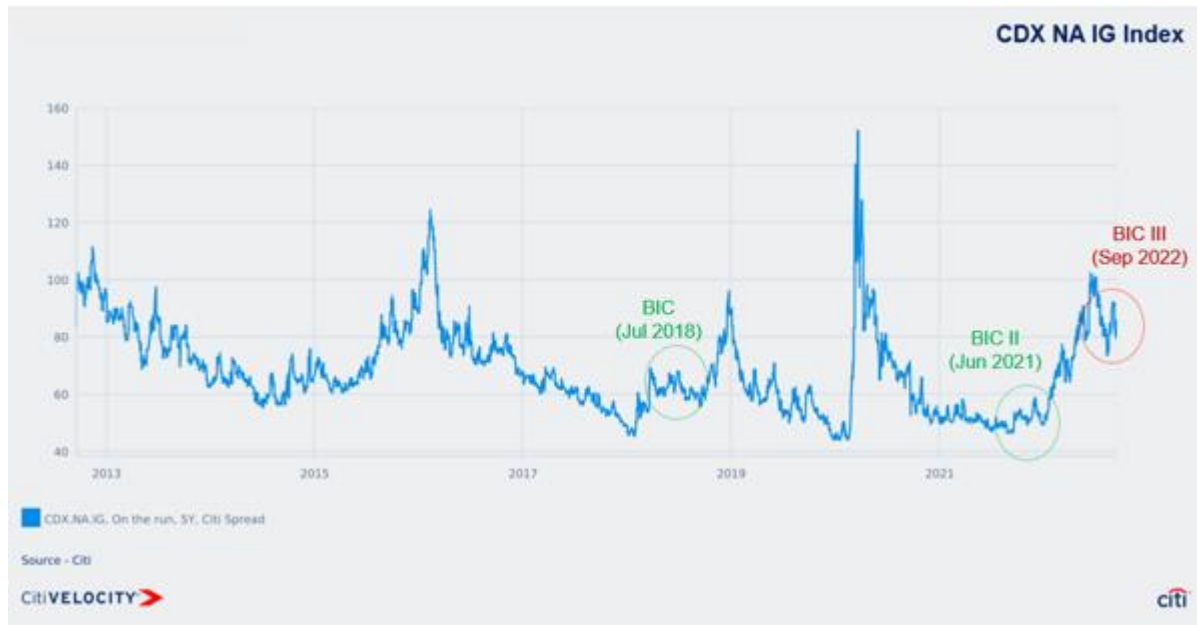
Prior to joining the Blackstone Group in 2008, Poh-Heng worked at Washington Square Investment Management, a specialist structured credit investment manager in London where he was part of the team managing a CLO vehicle listed on the London Stock Exchange. He was also part of the team that created an in-house Monte Carlo simulation model for the analysis of CLO investments. Earlier in his career, Poh-Heng worked at DBS Bank, S&P, IDEAglobal and IBJ focusing on fixed income, loan and structured credit products. Poh-Heng received his Bachelor's Degree with a major in Financial Analysis from Nanyang Technological University, Singapore. He was awarded the Ernst & Young Gold medal for Derivatives Securities Analysis and is a CFA Charterholder.

### **Author's Thoughts on IABS and BIC III**

Diversifying underlying portfolios is essential in times of crisis to make them more resilient. In IABS, investors now have the opportunity to pick up investment-grade floating-rate securitised tranches – particularly attractive in this rising interest rate environment, as global central banks are finally reversing the ultra-low rates policies that began after the Global Financial Crisis in 2008/09) - backed by senior secured infrastructure and project finance loans with a long operational track record.

Bayfront Infrastructure Capital (BIC) and Bayfront Infrastructure Capital II (BIC II) were previously priced during more benign market conditions, unlike the market for much of 2022 (see the graph below). The fact that Bayfront Infrastructure Capital III (BIC III) was priced at relatively tight levels in a very volatile market environment in September 2022 was impressive, especially in a week which saw the largest single day drop in equities since the start of the COVID pandemic.

In fact, BIC was redeemed a month earlier in Aug 2022, following the expiry of its non-call period – demonstrating the good performance of the deal and giving debt tranche investors the confidence in the ability of the manager to redeem the deal even when market is more volatile. Hence, it would not be a surprise if the manager chooses to redeem or refinance BIC III after its three years non-call period (expiring in October 2025) given its higher cost of funding relative to the underlying portfolio's weighted average spreads.



The tight pricing of BIC III relative to US BSL CLOs at the time of closing may well have validated investors' confidence in the collateral manager, IABS' structural protection features and the long-term track record and performance of the underlying infrastructure loans. According to Moody's, infrastructure debt securities experienced a substantially lower incidence of default and credit loss compared with non-financial corporates over an extended period from 1983 to 2021 – on average, an infrastructure debt security suffered credit losses amounting to 0.4% of its face value over five years and 0.6% of its face value over 10 years, compared with 5.8% and 8.7% respectively for a typical non-financial corporate security.

On the whole, it reinforces the clear distinction in credit quality between IABS and typical CLOs which has translated into tighter pricing for the former. The tighter relative pricing achieved by BIC III also means that existing holders of BIC II tranches should see a more stable MTM valuation – which is important, especially for senior tranche investors. Its shorter duration relative to CLOs also helps to reduce MTM volatility.

In the table below, we compare the new issue pricing for Bayfront's last two IABS issuances vs. US BSL CLOs. We have built in the ARRC's recommended credit spread adjustments to facilitate a like-for-like comparison between 2021 issuances (still using LIBOR as base rate) and 2022 issuances (which started to use Term SOFR as the base rate) – at 26.161bp for US BSL CLOs which mostly pay quarterly; and at 42.826bp for BIC II which pays semi-annually. On a spread over SOFR basis, the new issue pricing for AAA tranches of IABS tightened by around 13bp from June 2021 to September 2022, while over the same period, US BSL CLO AAAs widened by 60 to 90bp. The AA tranche of IABS was roughly unchanged over the same period, while US BSL CLO AAs widened by around 80-90bp.

Sep 2022	BIC III	Regular US BSL CLOs
AAA tranche new issue pricing (bp) – Spread Over SOFR	150-155 (3-yr RI)	190-230 (5-yr RI)

<b>AA tranche new issue pricing (bp) – Spread Over SOFR</b>	230 (3-yr RI)	270s-280s (5-yr RI)
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<b>Jun 2021</b>	<b>BIC II</b>	<b>Regular US BSL CLOs</b>
<b>AAA tranche new issue pricing (bp) – Effective Spread over SOFR</b>	163-168 <sup>^</sup> (3-yr RI*)	130-140 <sup>†</sup> (5-yr RI)
<b>AA tranche new issue pricing (bp) – Effective Spread over SOFR</b>	228 <sup>^</sup> (3-yr RI)	180s-190s <sup>†</sup> (5-yr RI)

\*RI: Replenishment or Reinvestment Period

<sup>^</sup>: Incorporates credit spread adjustment of 42.826bps over the original spread over LIBOR of 120-125bp and 185bp for AAA and AA tranche respectively

<sup>†</sup>: Incorporates credit spread adjustment of 26.161bps over the original spread over LIBOR of 110bp area and 160-170bp for AAA and AA tranche respectively

It is also encouraging to see the repeat issuance of a dedicated sustainability tranche in BIC III, this time with a tranche size of \$110.0m backed by \$163.8m of eligible green and social assets. Demand for this tranche was impressive at 1.43x oversubscription against the backdrop of a volatile credit market.

Notably, according to DNV, an international independent accredited registrar and classification society that has strong expertise in sustainability risk management, the sustainability notes of BIC III have qualified as secured sustainability standard bonds under the latest edition (June 2022) of the International Capital Market Association (ICMA) Green Bond Principles (GBP), ICMA Social Bond Principles (SBP) and Sustainability Bond Guidelines (SBG).

The sustainability notes have also been recognised by the Singapore Exchange, where they are listed, as meeting industry standards for green, social or sustainability fixed income securities.

The issuance of the sustainability tranche demonstrates that securitisation can play an important role in facilitating the shift towards much higher volumes of clean energy infrastructure investment in emerging market and developing economies.

### **Product and Transaction Highlights (BIC III)**

- **Quality:** All debt tranches are rated investment grade. Underlying project finance and infrastructure loans are well-seasoned and performing. At inception, 83.9% of the aggregate commitment amount of the portfolio relate to operational projects, while the remaining 16.1% relates to projects in advanced stages of construction and which benefit from appropriate credit mitigants, such as sponsor completion guarantees or sponsor support
- **Diversified access:** Transaction is backed by a diversified portfolio of 28 project and infrastructure loans across 26 projects in Asia Pacific, Middle East and the Americas and 8 industry sub-sectors



- **Track record:** Project and infrastructure loans have a long track record of good performance, exhibiting lower default and higher recovery rates than leveraged corporate debt
- **Uncorrelated strategy:** The tight relative pricing of BIC3 demonstrated that this asset class can potentially be seen as less correlated to other structured finance exposure and to the broader macroeconomic environment
- **Floating rate exposure:** A good hedge in a rising rate environment
- **Countercyclical nature:** Loans are supported by projects with stable and predictable long-term cash flows, including through offtake agreements entered into with reputable and creditworthy counterparties such as major global corporates, state-owned enterprises and government-linked sponsors. 94% of projects are underpinned by robust availability-based or fixed-price offtake or charter contracts. The remaining 6% of the portfolio is exposed to commodity price risk, represented by 2 integrated LNG projects.
- **Structural strength and resilience:** Rated tranches are structured to withstand multiple times the base case default rate
- **Strong Alignment of interest:** Risk retention of entire equity tranche via both sponsor and originator routes
- **Great access to the market:** Bayfront has demonstrated its ability to access the market even in difficult conditions.
- **Reputation:** IABS sponsor and manager's funding is backed by the Government of Singapore (AAA/Aaa/AAA rating)

## 2. Comparison between IABS and other Securitised Asset Classes

### Comparison between IABS and CLOs (See [Appendix 1](#) for more details)

Metrics (at inception)	IABS – BIC2 (2021)	IABS – BIC III (2022)	STWD 2021 SIF1 and SIF2	US BSL CLOs*	US MM CLOs**	EU CLOs*
<b>Weighted Average Spread (WAS) of underlying collateral pool (1)</b> See <a href="#">Appendix 1</a>	230bp	240bp	Around 380bp	Around 355bp	Around 560bp	Around 405bp
<b>Risk Retention (2)</b>	10% risk retention / full equity retention – Risk retention at the sponsor <b>and</b> originator levels	7% risk retention / full equity retention – Risk retention at the sponsor <b>and</b> originator levels	5% risk retention – Risk retention at the sponsor level	Not required	Not required	5% risk retention: sponsor or originator structure (legal requirement)
<b>Sustainability tranche</b>	\$120 million issue (part of Class A)	\$110 million issue (part of Class A)	NA	NA	NA	NA
<b>Deal upfront costs</b>	Upfront costs and expenses were borne by Bayfront as the sponsor, rather than at the deal level	Upfront costs and expenses were borne by Bayfront as the sponsor, rather than at the deal level	Upfront costs are charged to the deal	Upfront costs are charged to the deal	Upfront costs are charged to the deal	Upfront costs are charged to the deal
<b>Weighted average life (WAL) of underlying collateral pool</b>	5 to 6 years	5 to 6 years	7 years	7-9 years based on their initial WAL test	5-8 years based on their initial WAL test	7.5-8.5 years based on their initial WAL test
<b>WARF (at inception)</b>	748 (or 937 after notching adjustment by Moody's)	716 (under the traditional WARF disclosure regime)	Around 2260 (2260: Around B1)	Around 2750 (average) (2750: Around B2)	Around 3500 (3500: between B3/Caa1, closer to B3)	Around 2890 (2890: between B2/B3, closer to B2)

	(748: between Baa3/Ba1)  WARF of 1,017 under the new Moody's WARF disclosure regime, which does not incorporate any uplift from external credit support for ECA/MFI covered loans	(716: between Baa3/Ba1)  WARF of 901 (1,041 after notching adjustment) under the new Moody's WARF disclosure regime, which does not incorporate any uplift from external credit support for ECA/MFI covered loans				
<b>B1 and lower rating (underlying collateral pool)</b>	0.2%***	0.2%***	43–48%	Around 75%	NA	Around 97%
<b>Reinvestment during replenishment period (3)</b>	Only replenishment is allowed. No discretionary trading is permitted.	Only replenishment is allowed. No discretionary trading is permitted	Discretionary trading is allowed	Discretionary trading is allowed	Discretionary trading is allowed	Discretionary trading is allowed
<b>Reinvestment (RI) period (3) excluding static deals</b>	3 years	3 years	3 years	2-5 years	3-4 years	1-4.5 years
<b>Non-call period (3)</b>	3 years	3 years	1.5 years	Around 1.5 years	1-2 years	1–1.5 years
<b>Reinvestment post reinvestment period (3)</b>	Not allowed	Not allowed	Allowed subject to various criteria	Allowed subject to various criteria	Not allowed	Allowed subject to various criteria
<b>Diversity score</b>	NA	NA	NA	Around 74	34 to 50	Around 55

<b>Number of underlying issuers (4)</b>	25–30	25–30	30-35	Averaging around 230	45 to 124	Averaging around 130
<b>Initial OC Test Cushion (Lowest Rated Tranche) % points (5)</b>	4.0%	2.5%	5–6%	Averaging around 4.9%	Averaging around 6.1%	Averaging around 4.9%
<b>Countries</b>	13 countries across Asia-Pacific, Middle East and South America	13 countries across Asia Pacific, Middle East and the Americas	US	US	US	Western Europe
<b>Collateral liquidity score (W. Avg Depth) (6)</b>	NA	NA	NA	5.2	NA	4.8
<b>% of collateral not priced</b>	NA	NA	NA	0.5%	Around 75% (on average)	3.2%
<b>Covenants for underlying collateral (7)</b>	Detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance	Detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance	Up to 45% cov-lite loans allowed	Predominantly cov-lite	Largely covenanted	Predominantly cov-lite
<b>Sustainable assets</b>	46% of the portfolio are eligible sustainable assets	41% of the portfolio are eligible sustainable assets	NA	NA	NA	NA
<b>Underlying asset repayment schedule</b>	Typically amortising	Typically amortising	Largely amortising	Typically bullet	Typically bullet	Typically bullet

<b>Management fees (Total)</b>	20bp	20bp	0bp	Around 40bp	Up to 65bp	Around 45bp
<b>Net interest margin (Collateral margin less weighted averaged coupon) (8)</b>	Around 90bp	Around 60bp	Around 195bp	Around 95bp	Around 290bp	Around 95bp

Source: Moody's, Intex, CLO Research, LPC

\*Based on a sample of deals closed in 2H 2022

\*\*Based on a sample of deals closed in 2022

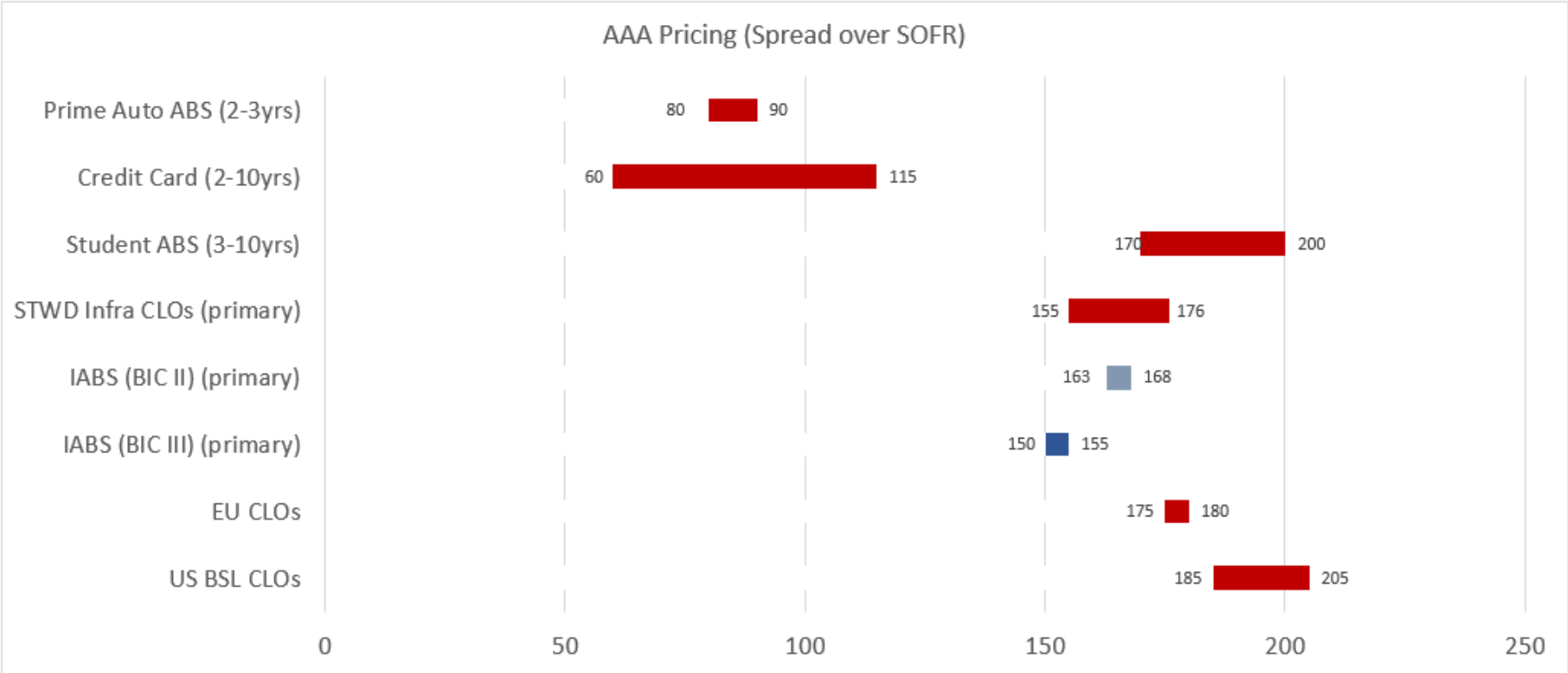
\*\*\*Based on the traditional WARF disclosure regime (benefits from an uplift from external credit support). Previously, Moody's credit estimates for covered loans incorporated the full loss-given-default benefit from the external credit support. Under the updated approach, the benefit of external credit support is recognized solely in the recovery assumptions made outside of the credit estimates. This update does not change the risk profile of the underlying loan portfolio (i.e., each loan's default probability and ultimate loss-given-default) and does not change the rating analysis.

### Comparison between IABS and other ABS Asset Classes

Securitisation Asset Class	IABS – BIC III (2022)	Prime Auto ABS	Student Loan ABS	Credit Card ABS	Agency MBS
<b>Collateral secured</b>	Yes	Yes	No	No	Yes
<b>Typical rating of collateral</b>	Baa/Ba (average)	NA	NA	NA	NA
<b>Number of collateral per deal</b>	20-50	1,000 to 10,000+	1,000 to 10,000+	300 to 10,000+	300 to 1,000+
<b>Typical AAA tranche credit spread (bp)</b>	150-155	80-90bp (2-3 years)	170-200bp (3-10 years)	60-115bp (2-10 years)	70-90bp
<b>Geographical diversity</b>	High	Low/Medium	Low/Medium	Low/Medium	Low/Medium
<b>Key credit drivers</b>	Credit estimates of loans, diversification, correlation, recoveries, ECA/MFI covers, nature of loans etc.	Sized by an assessment of historical PD and LGD (taking into account any proceeds from enforcement against the automotive loans etc.	Driven by an assessment of the borrower's willingness and capacity to pay, in granular portfolios, and loss severity assessments	Driven by an assessment of the borrower's willingness and capacity to pay, in granular portfolios, and loss severity assessments	Sized based on the ability of the borrower to make their repayments, with loss severity primarily driven by the amount of equity in the residential property if a default occurs

Source: Citi, Bayfront, ICM

AAA Tranche Pricing Comparison (as of 31 March 2023)



Source: LCD, Citi

## Track Record of project and infrastructure loans

### Ratings migration

- The tables below show that infrastructure ratings have been **more stable** than non-financial corporate ratings over a five-year horizon – more upgrades, less downgrades and defaults for infrastructure securities.

Total Infrastructure Securities									
Rating To:									
Rating From:	Aaa	Aa	A	Baa	Ba	B	Caa-C	Withdrawn	Default
Aaa	59.7%	15.2%	1.4%	0.3%	0.0%	0.0%	0.0%	23.5%	0.0%
Aa	0.8%	68.9%	6.5%	0.5%	0.1%	0.0%	0.0%	23.1%	0.0%
A	0.0%	5.4%	63.6%	5.5%	0.6%	0.1%	0.0%	24.7%	0.2%
Baa	0.0%	0.2%	12.0%	53.8%	5.6%	1.2%	0.6%	25.8%	0.8%
Ba	0.0%	0.1%	2.1%	19.7%	26.2%	4.9%	1.3%	42.6%	3.0%
B	0.0%	0.0%	2.4%	6.2%	12.1%	16.7%	4.1%	47.6%	10.9%
Caa-C	0.0%	0.0%	0.0%	3.5%	5.4%	8.3%	7.8%	42.9%	32.2%

Non-Financial Corporate Issuers									
Rating To:									
Rating From:	Aaa	Aa	A	Baa	Ba	B	Caa-C	Withdrawn	Default
Aaa	51.8%	22.7%	3.8%	1.1%	0.1%	0.1%	0.0%	20.2%	0.1%
Aa	2.3%	46.6%	26.8%	3.4%	0.6%	0.4%	0.0%	19.7%	0.1%
A	0.1%	3.3%	55.8%	17.7%	2.3%	0.7%	0.1%	19.6%	0.3%
Baa	0.1%	0.2%	8.8%	56.6%	7.5%	2.5%	0.7%	22.6%	0.9%
Ba	0.0%	0.1%	0.9%	14.7%	28.3%	11.9%	2.3%	35.6%	6.1%
B	0.0%	0.0%	0.2%	1.8%	7.7%	23.3%	8.0%	43.4%	15.5%
Caa-C	0.0%	0.0%	0.0%	0.3%	1.4%	7.1%	16.9%	50.1%	24.1%

Source: Moody's Investors Service

Source: "Moody's Infrastructure default and recovery rates, 1983-2021 (published 31 October 2022)"

### Default rates

Track Record of underlying collateral assets	Project Finance loans	Total Infrastructure Debt Securities	Non-Financial Corporate Issuers
Average 10-year cumulative default rates	3.6% <i>Implied cumulative default rate for loans backed by operational projects is 2.1% (year 3-10)</i>	Investment-Grade – 0.5% Speculative-Grade – 17.1% Ba – 7.5% B – 28.5% (1983-2021)	Speculative-Grade – 29.5% Ba – 14.4% B – 33.4% (1983-2021)
Average ultimate recovery rates	76.8% <i>The most likely RR is still 100%, in 61.4% of cases</i>	Senior secured: 94.0% (1983-2021)	1st Lien Bank Loan 65.5%, measured by trading prices (1983-2021)

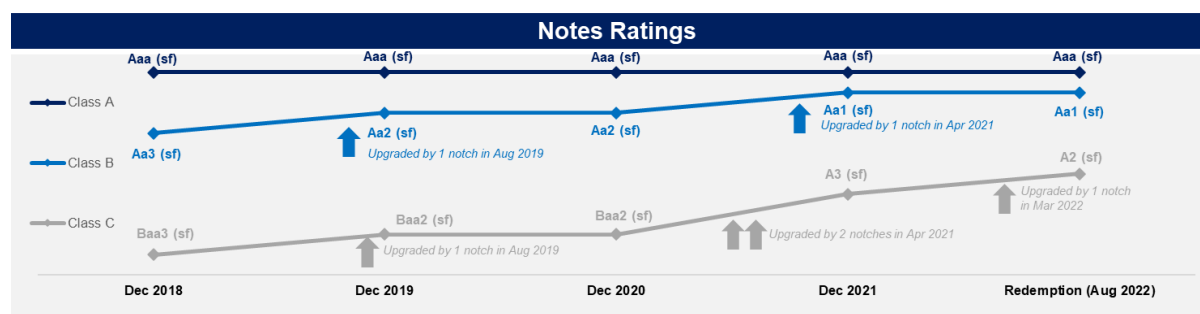
Source: "Default and recovery rates for project finance bank loans, 1983-2020 (published 15 March 2022)"; "Moody's Infrastructure default and recovery rates, 1983-2021 (published 31 October 2022)"; "Moody's Annual default study: After a sharp decline in 2021, defaults will rise modestly this year (published 8 February 2022)"

- As seen in the table above, project and infrastructure loans, as well as infrastructure debt securities, have a long track record of good performance, exhibiting lower default and higher recovery rates than leveraged non-financial corporate debt.

IABS also offers further structural benefits:

- (i) Underlying infrastructure debt provides several positive features (e.g., higher recovery rates (especially for ECA/MFI covered loans), contracted long-term revenue streams with creditworthy counterparties, geographical and industry sector diversity) that are less prevalent in some consumer structured finance sectors.
- (ii) Infrastructure debt has demonstrated robust performance since the start of the COVID-19 pandemic, given the critical nature of infrastructure projects to their host countries where usage/performance is potentially more insulated from the economic and business cycle. In contrast, some securitised product classes (e.g., leveraged loans, credit cards) have proven to be more susceptible to the general economic or business cycles.

### Track Record – BIC’s Ratings Performance



Source: Bayfront, Moody's

- Since inception in July 2018 until the Notes’ redemption on 31 August 2022, material overcollateralisation (OC) and interest coverage (IC) buffers had been built for BIC. CCC ratio remained at 0% throughout. The Class B notes were upgraded by Moody’s by one notch in August 2019 to Aa2, then again in April 2021 by one notch to Aa1. The Class C Notes were upgraded by Moody’s by one notch in August 2019 to Baa2, then again in April 2021 by two notches to A3, and again in March 2022 by one notch to A2.
- BIC’s OC ratio had consistently trended higher since 2020 due to the rapid deleveraging of its capital structure, contributed by its underlying collateral assets’ scheduled principal repayments, which are fixed at the financial close of each project/loan and is not determined by market conditions. Typically, conditional prepayment rate for CLOs would be much lower in times of volatility. The rated debt tranches of **BIC were fully redeemed in August 2022 – demonstrating the benefits of an amortising collateral pool and the good performance of the underlying assets.**
- Some of IABS’ structural features (e.g., no reinvestment post replenishment period, immediate principal amortisation of the most senior tranche even before replenishment period end-date and no discretionary trading of collateral) also



allow a faster build-up of credit enhancement compared to traditional CLO structures.

## **Part II**

The following Sections 3 to 6 are solely for information purposes. A reference to a particular investment or security, a credit rating or any observation concerning an investment or security provided in this research document is not a recommendation to buy, sell or hold such investment or security or make any other investment decisions and does not address the suitability of any investment or security.

This research document should not be relied on and is not a substitute for the skill, judgment and experience of users, its management, employees, and/or advisors in making investment and other business decisions. **(Please read the [Disclaimer](#) at the end of this document)**

### **3. Update on IABS Manager**

**IABS Manager:** BIM Asset Management Pte. Ltd. (“BIMAM”), a wholly-owned subsidiary of Bayfront.

#### **Investment Professionals and Process**

- 12 full-time staff, of which 11 are investment/finance professionals with average 13 years of experience
- Additional 3 headcounts being added in 2023
- Four senior management – CEO + 3 department heads for the following teams:
  - (i) Structuring & Distribution – responsible for structuring, marketing and placement of IABS securitisations, working with rating agencies, legal counsels and external advisers, investor relations work;
  - (ii) Loan Acquisitions – responsible for sourcing, reviewing and presenting potential loan investments to the Executive Committee for acquisitions;
  - (iii) Portfolio Management and Risk (PMR) – responsible for monitoring of loan investments post acquisition.

The three departments are each involved in the various stages of the product proposition, from initial due diligence and loan acquisition, to structuring, marketing and placement of IABS, and finally to ongoing monitoring of the asset portfolio and IABS transactions. The Loan Acquisitions team is responsible for reviewing and performing due diligence on all assets acquired by Bayfront, that eventually find their way to every IABS transaction since Bayfront acts as sponsor and originator. The Structuring & Distribution team and the Portfolio Management & Risk team are responsible for ongoing monitoring, management and reporting on every IABS portfolio/transaction.

#### **Staff Turnover rate**

2020: None

2021: 2 new hires, 1 departure

2022: 2 new hires, 1 departure

2023 (to date – April 2023): 2 new hires

#### **Investment Approval**

Approval and monitoring authority for the underlying assets, these are distributed across the Bayfront Executive Committee (EXCO), Bayfront Board of Directors and the CCH Risk Committee / Sub-Committee:

- The 5-person EXCO, comprising the CEO and 3 other senior representatives from parent company CCH, approves all investments
- The 5-person Board of Directors oversees management and approves certain exceptional investments outside of risk criteria.
- The CCH Risk Committee / Sub-Committee approves certain exceptional investments outside of risk criteria (that are not under the purview of the Board of Directors), divestments below carrying value and all asset restructurings

### **Credit Committee Process**

The Bayfront EXCO meets at least monthly to discuss operational and strategic matters with Bayfront's senior management and is also convened as and when required for every potential loan acquisition at (i) pre-screening stage and (ii) final due diligence and approval prior to acquisition. Investment decisions require unanimous consent from the EXCO. The Bayfront EXCO acts as the investment committee for loan acquisitions.

The Bayfront team also convenes with members of CCHMS (across all departments including Legal, Compliance, Group Risk management, Operations, Finance, Treasury, Technology and Human Resources) fortnightly to discuss any operational issues and key initiatives.

The Bayfront Board of Directors meets once every quarter, where Bayfront's management team and employees provide key updates on business and operational performance, status updates on key workstreams and upcoming strategic initiatives.

Lastly, Bayfront also has an environmental and social (E&S) Committee that meets once every quarter (typically on the same dates as Board of Directors meetings) to discuss E&S updates on the asset portfolio, any material E&S incidents/events or any changes to the E&S framework.

### **Gatekeeping and Monitoring – PMR and CCH Group Risk**

- The PMR team for Bayfront is comprised of 4 members (including the Head of Risk). They are the first level of gatekeepers, and they ensure that all possible risk factors are covered with mitigants in place. They work together closely with the Loan Acquisitions team. Operational performance of each project, ongoing monitoring, waivers and amendments are covered by the PMR team.
- The PMR team at Bayfront is supported by another four members who are based at CCH Group Risk department, who monitor the market, liquidity and operational risks for all the operating companies of the CCH Group. They also perform tasks like annual macroeconomic stress testing, IBOR transition impact studies, update of internal rating methodologies etc.

### **Number of Credits Per Analyst**

The Loan acquisition team has 4 members, comprising the Head of Loan Acquisitions and 3 other members who cover the origination of all credits acquired by Bayfront. All members in the team are agnostic to country and industry sector.

Post asset acquisition, the credits are managed and monitored by the PMR team, which is made up of 4 members, with plans to increase to 5 within 2023-2024. This translates to around 15 credits/borrowers per member. Other than monitoring the credits within BIC II and BIC III, the team also monitors the loans at the Bayfront warehouse portfolio.

Typically, it takes around 1 to 3 months from the expressions of interest stage to the investment committee approval of investments.

### **Support Professionals**

- “Insourcing” support from the parent holding company CCH for middle and back-office functions – finance, treasury, operations, technology, compliance, legal, HR, and administration. Some employees dedicate most or 100% of their time to supporting Bayfront alone. CCH provides support functions to the Bayfront group through a services agreement between CCH, Bayfront and BIMAM. As at 1 April 2023, CCH has 51 permanent employees.

### **Investment Process**

Bayfront has implemented a multi-layered credit review process to ensure that project and infrastructure loans that are selected are subject to a robust due diligence process before being admitted for consideration.

This process comprises the following components, namely:

#### *A. “Red flags” screen*

Potential loans and their underlying projects and key counterparties are screened for “red flag” issues that include the involvement of politically exposed persons, any sanctions and regulatory implications, potential persons who may be on international exclusion lists, past or recent adverse media coverage, government ownership, environmental, social or governance issues.

#### *B. Preliminary documentation review*

This process involves an initial review of the project information memorandum and/or other due diligence materials, together with an analysis of the key credit drivers and underlying risks. In parallel, a preliminary review of the key underlying credit and project documentation is undertaken to identify any third-party consents that may be required for both the disclosure of necessary information to key counterparties such as rating agencies, advisors and investors, as well as any consents that may be required for the transfer of the loans to Bayfront or future distribution vehicles. A pre-screening approval will be sought at this stage from Bayfront’s EXCO before moving ahead with detailed commercial due diligence.

#### *C. Detailed commercial due diligence*

This entails a fulsome review of the information package relating to each loan, including any information memorandum, due diligence reports and financial models, as well as detailed review of the underlying project and financing documentation, with a particular focus on events of default, security and other potential investor protections. As part of this stage of review, Bayfront also obtains from the potential sellers of the loans up to date information on the current status of the loans and the underlying projects, including in relation to payment status, compliance with applicable covenants, any due diligence updates and other related events.

Bayfront also undertakes an assessment of potential ESG risks associated with the relevant project, including a review of independent E&S consultant reports and monitoring reports, E&S

reporting commitments and performance of the project sponsors, and the E&S covenants and remedies in the loan documentation, and an assessment of the governance structure, safeguards and risks associated with the borrowers or sponsors of each project.

#### *D. Legal due diligence*

The loans are also subjected to a legal due diligence review in relation to transferability, confidentiality requirements, tax gross-up obligations, any potential governing law implications, security and other potential credit enhancements that may be available under the relevant loans. Loans that would constitute a material exposure of any IABS transaction portfolio are further subject to detailed due diligence involving interviews with the selling banks to determine ongoing compliance and any other necessary representations that may need to be sought in connection with the transfer of those obligations into the distribution vehicle, as well as a review of existing legal due diligence reports and any ongoing compliance certificates that have been delivered in respect of those loans.

#### *E. Credit approvals*

The credit approval process involves the preparation of a credit memo in relation to each loan which is planned for acquisition. This analysis comprises a summary of the transaction structure, any material project information, cash flow projections, risk analysis and a summary of key terms and conditions of the underlying loan, and is submitted to Bayfront's EXCO for final approval. Any exception to the delegated authority of Bayfront's EXCO will be escalated to Bayfront's Board of Directors and the CCH Group Risk Committee for exceptional approval. Only loans that pass all stages of the credit review process are accepted for acquisition. Any replenishment or sale of the loans will follow the same credit review and approval process.

#### **Access to Infrastructure Loans: Network of Contributing Banks**

Bayfront has signed MOUs with 26 banks to date, all of whom are active lenders in the Asia-Pacific and Middle East project finance market. This ensures that Bayfront's portfolio has a certain level of credit quality (having already been through at least one layer of due diligence at primary syndication stage) and diversity across sponsors, industry sectors and countries.

#### **Turndown Rate**

The turndown rate has historically been around 70%. On average, out of 100 individual loans identified, Bayfront carried out detailed due diligence on around 50 loans, 40 loans made it to the investment committee, and 30 were approved.

#### **Issuance Frequency**

Bayfront expects to issue IABS every 12–15 months.

#### **ESG Diligence**

ESG diligence is at the core of Bayfront's strategic focus. Every member of the Loan Acquisitions team is required to be trained and equipped with the required ESG knowledge and to undertake the relevant ESG analysis. E&S, as well as governance analysis is conducted by the Loan Acquisitions team as part of the due diligence process, in line with their E&S framework and governance risk assessment process. This is then reviewed by Bayfront's Portfolio Management and Risk and their retained consultancy – IBIS Consulting, before submission to the Bayfront EXCO for approval.

ESG analysis is composed of three parts:

- **E&S Framework**

Bayfront has in place an E&S Framework against which any loan acquisition or commitment is screened for inherent E&S impacts and potential residual E&S risks. Bayfront predominantly acquires debt financing projects that are operational or close to completion, mostly from financial institutions that have adopted the Equator Principles.

The objectives of Bayfront’s E&S Framework are to:

- assess the expected E&S impacts of projects financed by loans to be acquired and rate the residual E&S risks associated with these loans;
- engage with borrowers, beneficiaries and other project counterparties to manage and mitigate E&S impacts post loan acquisition;
- work with external stakeholders and counterparties to continuously seek improved E&S practices; and
- set out responsibilities for E&S risk identification, assessment, decision making, monitoring and escalation.

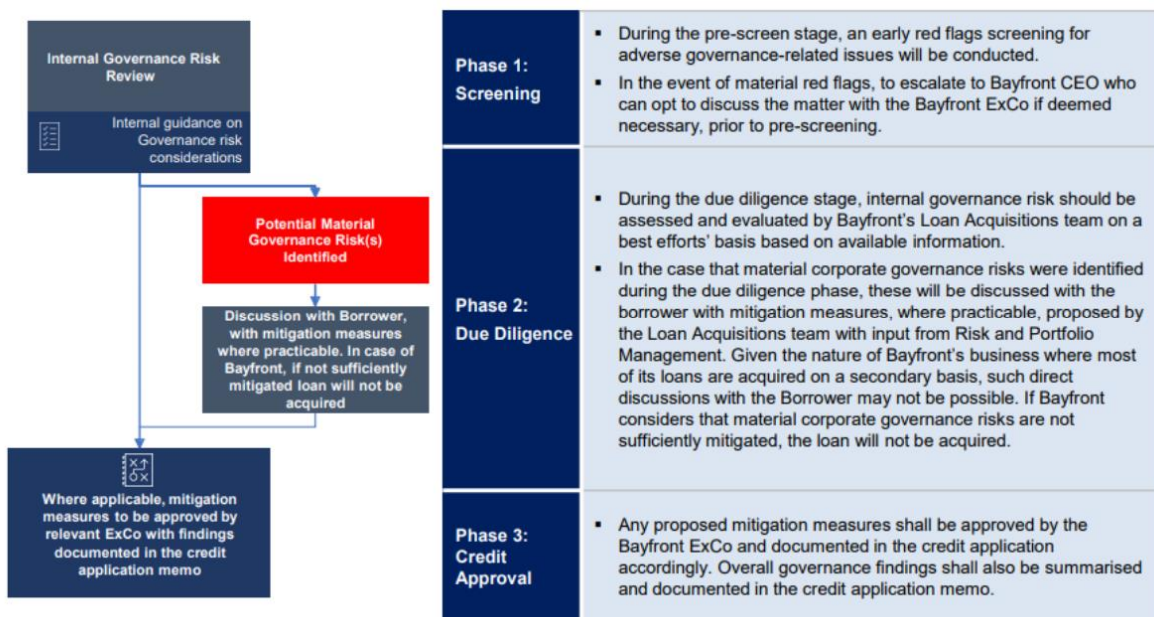
Bayfront’s E&S Framework comprises five key components:

- E&S Policy;
- E&S Categorisation;
- E&S Risk Rating Matrix;
- Exclusion List; and
- Sector Guides.

More information on Bayfront’s E&S Framework can be accessed here: <https://www.bayfront.sg/environmental-social-framework>

- **Governance Risk Assessment Process**

Bayfront adheres to the following internal governance risk review process for assessing and evaluating governance related risks of its investments.



- **Climate Risk (newly implemented from 2023)**

Bayfront also assesses impact of climate change on its loans and investments, from both transition and physical risk perspective. This includes monitoring the emissions intensity of the portfolio.

The key risk drivers of the climate risk scorecard comprise:

1. Transition Risk
  - a. Regulatory: Policy / regulatory changes such as carbon taxes, building energy efficiency standards, carbon footprint disclosures
  - b. Technology: Cost parity of renewable energy, emission abatement advancement, market eschewal of enabling tech
  - c. Stakeholder: Shift away from carbon-intensive sectors by customers/consumers, investors, insurers, other lenders, suppliers/vendors, and employees
2. Physical Risk
  - a. Acute risk: Increased severity and frequency of extreme weather events such as floods, hurricanes, droughts, wildfires, heat waves, cold waves
  - b. Chronic risk: Increase in mean temperatures, increased variability of precipitation patterns, sea-level rise

As part of its group-wide climate risk strategy, from now till 2030, Bayfront will be looking to gradually reduce its exposure to high carbon emission intensity assets (e.g. fossil fuels based projects such as oil & gas) and increase the share of medium (e.g. digital infrastructure, green shipping, transportation) and low (e.g. renewable energy) carbon emissions intensity assets in its AUM portfolio, as part of the organisation's goal to achieve net zero emissions for its total AUMs by 2050.

## **Sustainable Finance Framework**

Bayfront's Sustainable Finance Framework, which was first issued in March 2021 and subsequently updated in June 2022, demonstrates how Bayfront intends to issue green, social or sustainability notes, through IABS). These instruments finance the purchase of green and/or social loans that meet the eligibility criteria stated in the Sustainable Finance Framework. The issuance of green, social or sustainability notes will help to deliver positive environmental and/or social outcomes, which support Bayfront's sustainability strategy and vision.

Bayfront's Sustainable Finance Framework has been developed in alignment with the below sustainable finance principles and guidelines:

- International Capital Market Association Green Bond Principles 2021 (ICMA GBP)
- International Capital Market Association Social Bond Principles 2021 (ICMA SBP)

- International Capital Market Association Sustainability Bond Guidelines 2021 (ICMA SBG)
- ASEAN Capital Markets Forum ASEAN Green Bond Standards 2018 (ASEAN GBS)
- ASEAN Capital Markets Forum ASEAN Social Bond Standards 2018 (ASEAN SBS)
- ASEAN Capital Markets Forum ASEAN Sustainability Bond Standards 2018 (ASEAN SUS)

The key pillars of Bayfront’s Sustainable Finance Framework include:

- Use of Proceeds
- Project Evaluation and Selection
- Management of Proceeds
- Reporting
- External Review

The net proceeds of green, social and/or sustainability notes issued by Bayfront will be used to finance the purchase of eligible green and/or social loans, which will contribute towards the United Nations Sustainable Development Goals (“SDGs”) as listed below (this list is not exhaustive given the interconnectedness of the SDGs).

Eligible Green Loans	
Green Eligible Category	Contribution to the SDGs
Renewable energy	7
Clean transportation	11
Pollution prevention and control	11, 12
Sustainable water and wastewater management	6
Energy efficiency	9,11

Eligible Social loans	
Social Eligible Category	Contribution to the SDGs
Affordable basic infrastructure	6, 9
Access to essential services	3, 4

More information on Bayfront’s Sustainable Finance Framework can be accessed here: <https://www.bayfront.sg/sustainable-finance>

## Biographies of Bayfront’s Senior Management

- **Nicholas Tan** is the CEO and is responsible for the strategic leadership and vision of Bayfront. He was previously the Chief Operating Officer and the head of Structuring & Distribution of Bayfront, who was responsible for structuring and distribution activities, as well as operational oversight across a wide range of activities, including financial and management reporting, budgeting, liquidity management, stakeholders’ management, development and execution of strategic initiatives. Prior to that, he was a Senior Director in Corporate Strategy at Clifford Capital, where he led the structuring, execution and management of the Infrastructure Take-Out Facility by Bayfront Infrastructure Capital in July 2018. Before joining Clifford Capital in December 2016, he was with Bank of America Merrill Lynch, covering the Energy, Infrastructure, Power



and Utilities sectors for the investment banking division, where he led in origination and execution of capital markets (debt and equity) and M&A transactions for Southeast Asia. He was previously in investment banking with Standard Chartered Bank, covering the Asia mining and metals sector. He holds a Bachelor of Accountancy and Bachelor of Business Management (Summa Cum Laude) from the Singapore Management University.

- **Bryan Woon** is the Head of Structuring and Distribution of Bayfront, responsible for structuring and distribution activities, where he has led the execution and management of the BIC II and BIC III IABS transactions. He was previously part of the Corporate Strategy team at Clifford Capital, where he was involved in the day to day management of the inaugural project and infrastructure loans take-out facility and issuance by BIC in July 2018. Prior to joining Clifford Capital in 2018, he was with Citigroup in London and Singapore, primarily in debt capital markets where he led the origination, structuring and execution of numerous bond and regulatory capital transactions for financial institutions. He holds a Bachelor of Science in Industrial Economics from the University of Warwick, United Kingdom.
- **Saumitra Shrivastava** is the Head of Loan Acquisitions and oversees the loan acquisitions activities for Bayfront. He has extensive experience in originating and structuring complex project finance transactions across multiple sectors. Prior to joining Bayfront, he was with multilateral organisations and global commercial banks, including the Asian Development Bank, BNP Paribas and Sumitomo Mitsui Banking Corporation. He has financed and advised on projects across various geographies including, Asia Pacific, Central Asia and European and Middle East regions. He holds a Bachelor's and Master's in Economics from University College London, United Kingdom.
- **David Leong** is the Head of Risk of Bayfront Infrastructure Management, responsible for the credit risk analysis and portfolio management activities. He was previously a Director in Risk at Clifford Capital, where he was responsible for monitoring and risk management of the project and infrastructure loans within Bayfront Infrastructure Capital Pte. Ltd. Prior to joining Clifford Capital in 2018, he was with PricewaterhouseCoopers, Mizuho Bank, United Overseas Bank and Bank of China across various roles in project finance, business recovery and forensic accounting. He holds a Bachelor of Accountancy from Nanyang Technological University.

Bayfront had recently undergone a change in leadership, with the previous CEO Mr. Premod Thomas retiring on 1 April 2023, succeeded by the previous COO Mr. Nicholas Tan as the new CEO. Mr. Thomas will be taking up a non-executive Senior Advisor role at the parent company CCH with effect 1 May 2023.

#### **4. Understanding Portfolio Analysis – BIC III**

##### **Availability-based or fixed price off-take contracts**

Project finance loans with lower credit risk tend to benefit from long-term contracts providing predictable and stable revenue from creditworthy counterparties, with limited competition due to traditionally high barriers to entry.

A robust debt service coverage ratio (DSCR) throughout the life of the project debt usually indicates a greater tolerance for occasional variations in operational performance as well as greater economic incentives for the sponsor to provide support.

For financing structures where debt is fully amortising and fully repays during the term of the project's off-take agreement, the DSCR is a powerful metric in the assessment of the ability of the project to service its debt obligations. Of the 28 loans in BIC III's portfolio at inception, 5 loans comprising 19.9% of the portfolio are amortising with a substantial balloon payment at maturity, 1 loan comprising 6.2% of the portfolio has bullet maturity, and the remaining 22 loans comprising 73.9% of the portfolio are fully amortising.

Only one project in the portfolio had a reported DSCR slightly less than 1.25x (recorded in FY2021) but it is mitigated by its strong investment grade rating profile and long operating track record of 6 years and counting.

Another notable observation is the stability of the top-line DSCR metrics since 2019 as shown in the tables below highlighting the resilient nature of the loans and their underlying projects – the vast majority of the infrastructure projects are underpinned by long-term fixed price offtake agreements, which has supported revenue generation and maintained stable DSCRs.

Average 2021 DSCR	Number of projects	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
1.00x – <1.25x	1	8.0	2.0%
1.25x – <1.50x	4	92.0	22.8%
1.50x – <1.75x	6	81.1	20.1%
1.75x – <2.00x	2	24.3	6.0%
2.00x – <2.25x	2	17.3	4.3%
>2.25x	1	15.0	3.7%
Not available	10	165.0	41.0%

Average 2020 DSCR	Number of projects	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
1.00x – <1.25x	3	48.0	11.9%
1.25x – <1.50x	4	85.1	21.1%
1.50x – <1.75x	3	42.9	10.7%
1.75x – <2.00x	–	–	–
2.00x – <2.25x	3	29.3	7.3%
>2.25x	2	27.3	6.8%
Not available	11	170.0	42.2%

Average 2019 DSCR	Number of projects	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
1.00x – <1.25x	3	58.7	14.6%
1.25x – <1.50x	3	64.5	16.0%
1.50x – <1.75x	3	33.4	8.3%
1.75x – <2.00x	1	15.0	3.7%
2.00x – <2.25x	3	33.8	8.4%
>2.25x	1	15.0	3.7%
Not available	12	182.3	45.3%

Source: Offering Memorandum

### **Industry sub-sectors**

The projects are diversified across eight industry sub-sectors, of which conventional power and water was the largest at 36.2%, followed by renewable energy at 23.6%. There are no coal fired power plants within the portfolio, as Bayfront has explicitly excluded all coal related projects from its investments under its Sustainable Finance Framework.

Around 40.5% of the portfolio by aggregate commitment amount were eligible sustainable assets – within the conventional power and water, renewable energy, data centre and electricity transmission sub-sectors – which backed the dedicated sustainability tranche.

Sector	Number of loans	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
Conventional power and water	9	145.9	36.2%
Renewable energy	6	95.0	23.6%
LNG and gas	4	59.5	14.8%
FPSO/FSRU	3	30.0	7.4%
Other oil and gas	3	30.0	7.4%
Data centre	1	25.0	6.2%
Electricity transmission	1	12.3	3.1%
Metals and mining	1	5.0	1.2%

Source: Offering Memorandum

Approximately 6.1% of the total loan commitment amount in the portfolio from two loans involves projects that are exposed to commodity price risk (as their offtake price is linked to moving average oil and gas prices), while the remaining 93.9% of the total loan commitment amount in the BIC III's portfolio finances projects that are underpinned by robust availability-based or fixed price off-take or charter contracts.

As mitigants, the two loans/projects that are exposed to commodity price risk are very well seasoned and have comfortable DSCR cushions. The first one has an investment-grade rating with solid DSCR of over 2x (in 2021) and its underlying project has been operational since 2017, while the second loan (with a very good DSCR of over 1.6x) matures in 2024 and its underlying project has been operational since 2014. Both projects are also backed by very strong sponsor groups that consists of blue-chip major oil & gas conglomerates.

Commodity price exposure	Number of loans	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
Availability-based or fixed price off-take or charter contracts	26	378.2	93.9%
Commodity price exposure	2	24.5	6.1%

Source: Offering Memorandum

## Ratings Distribution

Moody's Rating Factor (based on Moody's previous credit estimate disclosure policy) <sup>17</sup>	Percentage of aggregate commitment amount outstanding in Portfolio
10 – 40 (Aa1 – Aa3)	12.0%
70 – 180 (A1 – A3)	16.3%
260 – 610 (Baa1 – Baa3)	28.2%
940 – 1766 (Ba1 – Ba3)	43.3%
2220 – 3490 (B1 – B3)	0.2%

Moody's Rating Factor (based on Moody's existing credit estimate disclosure policy) <sup>18</sup>	Percentage of aggregate commitment amount outstanding in Portfolio
10 – 40 (Aa1 – Aa3)	3.7%
70 – 180 (A1 – A3)	16.2%
260 – 610 (Baa1 – Baa3)	30.5%
940 – 1766 (Ba1 – Ba3)	46.5%
2220 – 3490 (B1 – B3)	3.1%

\*The first table is based on Moody's previous credit estimate disclosure policy which incorporates the benefit of higher recovery rates (lower LGD) associated with the external credit support provided for Collateral Obligations covered by export credit agencies (ECAs) and multilateral financial institutions (MFIs). The second table is based on the official Moody's Rating Factors assigned by Moody's to each Collateral Obligation under their revised credit estimate disclosure policy, which does not incorporate the benefit of external credit support for Collateral Obligations covered by ECAs and MFIs.

While the disclosure and reporting regime for individual credit estimates and WARFs by Moody's may have changed, the process of portfolio analysis and ratings of the Notes by Moody's itself is unchanged. Bayfront has committed to continue reporting

on both regimes to facilitate an apples-to-apples comparison for investors with its previous issuances and also with historical WARF figures reported.

Previously, Moody's credit estimates for covered loans incorporated the full loss-given-default benefit from the external credit support provided by ECAs and MFIs. Under the updated approach, the benefit of external credit support is recognised solely in the recovery assumptions made outside of the credit estimates. Nonetheless, this updated approach does not change the risk profile of the underlying loan portfolio (i.e. each loan's default probability and ultimate loss-given-default) and does not change the rating analysis.

The majority of the pool is rated investment grade (rating factor of 610 and below) under both old and new disclosure regimes. Only 0.2% of the collateral pool is rated B1 or lower if the benefit of external credit support is taken into consideration. Without considering the benefit of external credit support, the *tail risk* of the portfolio only represents 3.1%. That said, this loan is 95% covered by MIGA political risk insurance (PRI) which means that 95% of the loan's principal amount has been assigned by Moody's a higher recovery rate of over 90%.

### **Geographical project location**

According to Moody's study, in the emerging market and developing economies (EMDE) subsets, country risk is the most prevalent cause of default (35.4% for EMDE-A and 39.7% for EMDE-B), followed by market risk. Almost all the defaults attributed to country risk were caused by either (1) currency transfer or convertibility constraints or (2) local currency devaluation.

A significant number of defaults in the EMDE-A and EMDE-B subsets in Latin America and Asia coincided with sovereign crises in Argentina (2001-02), Brazil (1999, 2002), Indonesia (1997-2002) and Thailand (1997-2000), arising from a systemic banking crisis, currency crisis and/or sovereign debt crisis. While the number of defaults in emerging and developing markets may be low, they tend to cluster around country risk events.

Moody's however also noted that country risk tends to be a less critical driver of default risk once a project attains an operating track record. This is particularly relevant for Bayfront's IABS portfolios, which are predominantly made up of brownfield, operational assets. *Only 16.1% of the BIC III portfolio at inception involved projects still under construction.*

The BIC III portfolio is very diversified across regions and countries, as shown in the table below. Exposure to sub-investment grade foreign currency country rating stands at around 23.6%, with less than 8% exposure to foreign currency country rating below Ba3 (of which around 5.0% is uncovered).

While the uncovered 5% exposure may have low foreign currency country ratings – namely Cambodia (0.2%) and Papua New Guinea (4.8%) – these two positions are mitigated by their very seasoned operational status, strong offtakers and a solid DSCR performance. Besides, the exposure to Cambodia is one that is considered an

essential service to the country's electricity needs, while the exposure to Papua New Guinea is maturing soon in 2024.

Country distribution of the identified portfolio  
Percentage relative to the identified portfolio's par amount

Country of Project	Foreign Currency Country Ceiling	Foreign Currency Country Rating	% of Identified Pool	Covered Sub-Pool*	Uncovered Sub-Pool*
Australia	Aaa	Aaa	1.2%	0.0%	1.2%
United States of America	Aaa	Aaa	3.7%	0.0%	3.7%
United Arab Emirates	Aaa	Aa2	3.7%	0.0%	3.7%
Qatar	Aa1	Aa3	10.5%	0.0%	10.5%
China	Aa1	A1	6.2%	0.0%	6.2%
Kuwait	Aa2	A1	2.0%	0.0%	2.0%
Saudi Arabia	Aa2	A1	15.4%	0.0%	15.4%
India	A3	Baa3	17.4%	0.0%	17.4%
Indonesia	A3	Baa2	16.1%	5.1%	11.0%
Brazil	Baa2	Ba2	7.4%	0.0%	7.4%
Bangladesh	Ba2	Ba3	8.3%	7.9%	0.4%
Cambodia	B1	B2	3.1%	2.9%	0.2%
Papua New Guinea	B1	B2	4.8%	0.0%	4.8%
<b>Total</b>			<b>100.0%</b>	<b>15.9%</b>	<b>84.1%</b>

\*Covered sub-pool includes loan exposure in the identified portfolio that is covered by an external credit provider under certain types of guarantees or insurance policies. Uncovered sub-pool includes loan exposure that is not covered by an external credit provider.  
Source: Moody's Investors Service

## Countries of payment risk

Country where ultimate source of payment risk is located	Number of loans	Aggregate commitment amount outstanding (US\$ million)	Percentage of aggregate commitment amount outstanding in Portfolio
India	5	70.0	17.4%
Saudi Arabia	3	62.0	15.4%
Indonesia	3	44.3	11.0%
Qatar	3	42.5	10.5%
Brazil	3	30.0	7.4%
China	1	25.0	6.2%
South Korea	1	20.7	5.1%
Bangladesh	1	20.0	5.0%
Papua New Guinea	1	19.5	4.8%
United Arab Emirates	2	15.0	3.7%
USA	1	15.0	3.7%
Suprasovereign	1	13.4	3.3%
Cambodia	1	12.3	3.1%
Kuwait	1	8.0	2.0%
Australia	1	5.0	1.2%

Source: Offering Memorandum

As seen above, the BIC III portfolio is well diversified across many countries where the ultimate source of payment risk is located. Certain countries that were not featured in the earlier table of countries of project location refer to the jurisdictions which are providing ECA or MFI cover to the loans (e.g., Korea, Suprasovereign).

Approximately 15.9% of the total loan commitment amount in the BIC III is supported by ECAs and MFIs through various forms of credit enhancement such as guarantees and insurance policies.

### **Loan participations**

BIC III has acquired indirect exposures for about 27.5% of the portfolio of loans via participation agreements with single-A-rated banks. Moody's has taken this counterparty risk into their modelling, at the early CDOROM stage.

### **Construction risk**

Approximately 83.9% of the total loan commitment amount in the portfolio comprises completed, operational projects. All of the projects under construction benefit from sponsor completion guarantees or sponsor support.

<b>Construction risk</b>	<b>Number of loans</b>	<b>Aggregate commitment amount outstanding (US\$ million)</b>	<b>Percentage of aggregate commitment amount outstanding in Portfolio</b>
Completed projects	25	337.7	83.9%
Projects under construction	3	65.0	16.1%

Source: Offering Memorandum

### **Project seasoning**

Around 60% of the portfolio is comprised of loans to seasoned projects (2 years or longer) as of BIC III's issue date.

According to Moody's, marginal annual default rates of project finance loans remain consistent with the marginal default rates of high speculative-grade credits in the first three years. However, they trend toward marginal default rates consistent with single-A category corporate ratings by year seven from cohort formation.

### **Transition to SOFR**

As at the Issue Date, 88.8% of the BIC III portfolio consist of floating rate loans that bear interest based on 1-month, 3-month or 6-month LIBOR, with 11.2% bearing interest based on daily non-cumulative compounded SOFR. The remaining portfolio may transition their benchmark rates to bear interest based on Term SOFR, daily non-cumulative compounded SOFR or other applicable floating rate indices that are not based on LIBOR, before or around 30 June 2023. Moody's has incorporated various scenarios for interest rate paths in their modelling (see [Appendix 2](#) for more details).

BIC III's notes are already using 6-month Term SOFR as benchmark rate, so this will minimise the basis mismatch with LIBOR-based assets, by the time the entire asset portfolio has fully transitioned before or around 30 June 2023. This is also in line with market practice, as all US CLOs issued after 31 Dec 2021, including refinancings and resets, were printed with SOFR as the benchmark rate.

### **Impacts from rising operating costs**

In terms of potential impacts from rising operating costs, based on the BIC III portfolio as of 31 December 2022:

- i. About 16% of the aggregate outstanding commitment amount benefits from an investment grade rated MFI or ECA guarantee or insurance against the corresponding Obligor's payment default;
- ii. About 50% of the aggregate outstanding commitment amount have operating and maintenance (O&M) costs borne by the offtaker;
- iii. About 45% of the aggregate outstanding commitment amount have the ability to pass through inflationary impacts to their respective offtakers under their corresponding offtake agreements; and
- iv. About 31% of the outstanding commitment amount do not have inflationary pass through features in their corresponding offtake agreements, but about half of these are renewable energy projects whose O&M expenses are managed by the sponsors, while the other half are mainly LNG projects whose revenues have moved up in tandem with the higher oil prices.

### **Impacts from rising interest rates**

In terms of the potential impact of rising interest rates have on the BIC III portfolio, based on the outstanding principal value of the loans within the Portfolio as of 31 December 2022:

- (i) About 16% of the outstanding commitment amount benefits from an investment grade rated MFI or ECA guarantee or insurance against the corresponding Obligor's payment default;
- (ii) About 81% of the outstanding commitment amount have a certain level of interest rate hedging in place to manage this risk;
- (iii) About 11% of the outstanding commitment amount do not have interest rate swaps in place but about half of these are LNG projects whose revenues have moved up in tandem with the higher oil prices.

*Please see the final [offering memorandum](#) for more information, including the risks relating to the collateral obligations and the project issuers.*



## 5. Understanding Structure Analysis – BIC III

### Bayfront Infrastructure Capital III (BIC III) Capital Structure

Class/Tranche	Tranche spreads	Orig Ratings	Notional (\$ M)	Issue Price
A1	SOFR_6MO + 1.55%	Aaa (sf)	187.9	100.0%
A1-SU (sustainability tranche)	SOFR_6MO + 1.50%	Aaa (sf)	110.0	100.0%
B	SOFR_6MO + 2.30%	Aa1 (sf)	33.4	100.0%
C	SOFR_6MO + 4.60%	Baa3 (sf)	43.0	95.8%
Pref Shares	NA	NR	30.2	

The original preference shares par notional was \$28.4m. However, an extra \$1.8m of preference shares were issued (at par) in order to fund the original issue discount of 4.2% that was offered on the Class C Notes.

BIC III's payment waterfall is consistent with that of a typical CLO – it pays the tranches sequentially in both the interest and principal waterfalls (pro-rata among tranche A1 and A1-SU which rank pari passu with each other). Both waterfalls include OC and IC tests, as shown in the table below.

Test	Ratio at issue date	Trigger	Cushion
Class A/B OC Test	121.6%	116.6%	5.0%
Class A/B IC Test	NA	110.0%	NA
Class C OC Test	107.6%	105.1%	2.5%
Class C IC Test	NA	102.5%	NA

**OC tests:** OC tests provide additional credit support for the rated tranches. For instance, if the Class C OC ratio is tripped (below 105.1%), the deal will divert interest cash flow (after paying the scheduled interest on Class C tranche) to repay the senior-most outstanding tranche until the breached OC ratio is cured.

- OC ratio is calculated by dividing (a) the adjusted collateral principal amount by (b) the sum of the principal amount of the relevant tranches. For example, the OC ratio at the class C level, calculated on the issue date, would be \$402.7m/\$374.3m (sum of class A to class C notional) =107.6%.
- The adjusted collateral principal amount means the aggregate principal balance of the collateral obligations excluding excess Caa and defaulted assets, each at the lower of their respective market values and Moody's recovery amounts<sup>2</sup>.
  - Excess Caa assets are those Caa-rated loans whose total notional exceeds 10% of the portfolio principal balance.

<sup>2</sup> Calculated as the product of the applicable Moody's recovery rate for the type of loan (as set out in Moody's rating methodologies, e.g. ECA and MFI covered loans would have around 95% recovery rate) and the principal balance of the collateral obligation.

- Excess Caa or defaulted assets are carried at the lower of their market values and Moody's recovery amounts, which is common practice in a typical CLO.

**IC test:** IC tests indicate the availability of interest proceeds from collateral assets to cover the next upcoming interest payments on the rated tranches. In similar fashion, if the Class C IC ratio is tripped (below 102.5%), the deal will divert interest cash flow (after paying the scheduled interest on Class C tranche) to repay the senior-most outstanding tranche, thereby also reducing the aggregate amount of interest payable to the Class A, B and C tranches, until the breached IC ratio is cured.

- IC Ratio is calculated by dividing (a) the sum of collateral interest amounts received and scheduled interest payments not yet received in the due period by (b) the scheduled interest payments due on the relevant tranches on the immediate following payment date.

### **Replenishment period**

As compared to a typical CLO, BIC III (as with Bayfront's other IABS) do not permit any discretionary trading during the replenishment period. The collateral manager is only allowed to replenish collateral under three circumstances: (i) full early prepayment of any collateral obligation, (ii) sale of any collateral obligation (due to default or credit impairment), and (iii) cancellation of any undrawn commitments on the collateral obligations. Pursuant to (ii) above, the collateral manager may sell any defaulted assets or credit-impaired assets, subject to the satisfaction of all OC and IC tests, and that the aggregate notional of credit-impaired assets that are sold within any six-month period cannot exceed 15% of the initial total portfolio notional.

The manager could replenish the portfolio with eligible investments during the 3-year replenishment period, but all newly purchased assets must have a public rating, or a credit estimate assigned by Moody's. Every replenishment made is subject to a rating agency confirmation by Moody's that the proposed replenishment will not result in the reduction or withdrawal of the ratings assigned to any of the rated tranches. The manager has to identify a suitable replenishment collateral obligation within 45 business days since the replenishment proceeds were received (through full prepayment, cancellation of undrawn commitments or sale of defaulted or credit-impaired assets, as the case may be).

### **Post replenishment period**

No reinvestment is allowed post the replenishment period. In other words, all scheduled or non-scheduled proceeds received from the collateral pool after the replenishment period will be used to pay down the rated tranches sequentially.

### **Structure Quantitative Analysis**

The following section addresses the structure analysis of BIC III – testing the resilience of its capital structure relative to its collateral portfolio under the various stress scenarios.

In the base case, a cumulative default rate of 7% is used – which is slightly more conservative than the 6-year default rate implied by BIC III’s WARF.

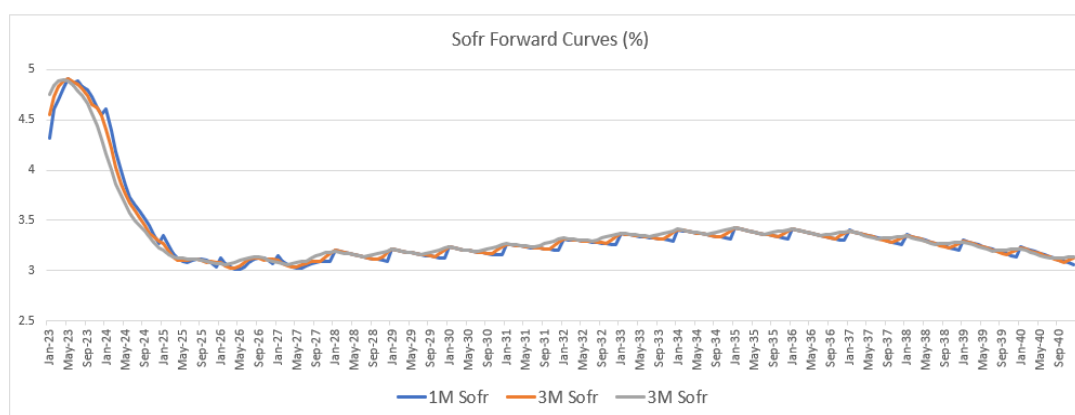
The resilience of the IABS structure would be tested under the various stress scenarios including 3 times and 5 times the base case default rate, as well as stressing some of the weaker credits in the portfolio.

### **Base case**

#### Assumptions

Prepayment rate	5%
Interest Rates	Forward curves*
Default rate	1.0% annual default rate for the first 7 years
Recovery rate	75%
Recovery lag	24 months
Replenishment	<ul style="list-style-type: none"> <li>Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price</li> </ul>

\* Source: Intex. Given the expected transition to SOFR, the portfolio modelled by Intex assumes 100% SOFR-linked loans.



Source: Intex

The annual default rate of 1% per year (for the first 7 years) translates to around 7% of cumulative default rate. The recovery rate used is 75% which is somewhere between historical observations (ultimate recoveries) under the Moody’s study at 76.8% and Moody’s computed weighted average recovery rate for BIC III at 70.0%. Prepayment rate assumed is 5% (this refers to the unscheduled prepayment rate), which is in line with recent BIC II’s prepayment rate. The replenishment assumptions are in line with the existing portfolio metrics.

*Under this base case scenario, the Class C tranche is seeing around 8.8% IRR (DM of 525bp). If this deal is refinanced immediately after its non-call period, the Class C tranche would see a higher IRR of 10.4% (DM of 631bp), given its discounted issue price.*

**Stress testing scenario one – 3 times the base case default rate and longer recovery lag**

Assumptions

Prepayment rate	5%
Interest Rates	Forward curves
Default rate	3.0% annual default rate for the first 7 years
Recovery rate	75%
Recovery lag	36 months
Replenishment	Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price

*All rated tranches are repaid in full without any impairment in this stress scenario one.*

**Stress testing scenario two – 5 times the base case default rate and lower recovery rate and longer recovery lag**

Assumptions

Prepayment rate	5%
Interest Rates	Forward curves
Default rate	5.0% annual default rate for the first 7 years
Recovery rate	70%
Recovery lag	36 months
Replenishment	Same profile in terms of spreads and maturity as the existing portfolio but at 99.5% price

*In this stress scenario two, Class A and B tranches are repaid in full without any impairment. While the Class C tranche would see a principal impairment (based on original principal amount) of 29.6% in this scenario, its IRR remains healthy at 6.4% (DM of 293bp).*

**Stress testing scenario three – default all assets with over 300bp spreads over the next three years**

Assumptions

Prepayment rate	5%
Interest Rates	Forward curves
Default rate	Default all assets with over 300bp spreads over the next three years
Recovery rate	85% (presence of external credit support)
Recovery lag	36 months

*In this stress scenario three, all rated tranches are repaid in full without any principal impairment. The Class C tranche's IRR remains healthy at 7.9% (DM of 439bp).*

**Stress testing scenario four – default all assets with over 250bp spreads over the next three years**

Assumptions

Prepayment rate	5%
Interest Rates	Forward curves
Default rate	Default all assets with over 250bp spreads over the next three years
Recovery rate	85% (presence of external credit support)
Recovery lag	36 months

*In this stress scenario four, Class A and B tranches are repaid in full without any impairment. While the Class C tranche would see a principal impairment (based on original principal amount) of 34.0% in this scenario, its IRR remains decent at 5.6% (DM of 210bp).*

*Finally, the breakeven default rate at the Baa-rated Class C tranche is at around 10 times the base case default rate, with 70% recovery rate. Breakeven default rate refers to the maximum default rate the Baa-rated Class C tranche can withstand and yet achieve a 0% IRR.*

Overall, the above stress scenarios highlight that the IABS' capital structure is sufficiently robust and provides good credit support to all the rated tranches.

## **6. Conclusion**

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The role of securitisation can serve as a valuable solution to address the significant infrastructure financing gap and facilitate capital inflow into clean and sustainable projects by mobilising institutional capital into infrastructure debt.

Bayfront's IABS programme, being a trailblazer, has increasingly gained recognition from a growing investor base. The pricing of its latest deal – BIC III – clearly demonstrates a genuine demand for this asset class.

As more series of IABS are issued and the investor base becomes deeper and broader over time, coupled with its performance track record, it would be no surprise to see secondary market liquidity and trading grow by leaps and bounds in the future.

While the securitisation of infrastructure senior secured debt in Emerging Markets is considered relatively new, the underlying asset class has a solid history and operating track record above that of corporate debt. This, coupled with the Bayfront's credentials and IABS' structural protection features, means that IABS is well-positioned to see an upward trajectory of growth and success.

Further, the floating rate nature of IABS and the underlying collateral obligations is also attractive for investors in the current interest rate climate. Last but not least, the resilience of the underlying asset class of infrastructure debt (through the pandemic, geopolitical tensions, energy crisis, cost of living crisis) should also be welcomed as the world grapples with global economic and geopolitical uncertainty.

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## **Appendix 1: Key structural differences between IABS and CLOs**

### **(1) Weighted Average Spread (WAS) of underlying collateral pool**

IABS' portfolios have a much lower weighted average spread than both US and EU CLOs.

This highlights the fact that IABS' portfolios are of higher credit quality compared to the regular CLOs from a credit spread perspective.

### **(2) Risk Retention**

Bayfront is committed to holding no less than 5% of the capital structure of its IABS issuances, in complying with minimum retention requirements. In both BIC II and BIC III, Bayfront retained 100% of the equity, which comprised 10% and 7% of the capital structure for each issuance, respectively. Bayfront may decide to place a portion of them with third-party investors in order to manage their overall IABS equity exposure, but will at all times still retain at least 5% of each securitisation in order to comply with the minimum risk retention requirements.

Bayfront is required under the EU Securitisation Regulation ("EUSR") and UK Securitisation Regulation ("UKSR") to retain at least 5% of the total transaction size at inception, for each IABS issuance.

To build the collateral portfolio, Bayfront buys loans from originator banks, who are then typically required to commit to holding at least 30% of their pre-sale exposure in the loans sold to Bayfront, with exceptions permitted in certain circumstances (e.g. Bayfront already has existing exposure to such loan or project, and is therefore familiar with the underlying borrower's credit)

This demonstrates a double layer of risk retention, at the sponsor (Bayfront) level with respect to the equity tranche of the IABS, and the originator (selling banks) level with respect to the underlying collateral.

Overall, the alignment of interest here is strong compared to the minimum 5% risk retention requirement in the EU CLO landscape.

### **(3) Reinvestment post reinvestment period and non-call period**

BIC II and BIC III have a relatively short reinvestment period of 3 years and a longer non-call period compared to US and EU CLOs.

Typically, US and EU CLOs would see around 1-year non-call period for a 3-year reinvestment deal, but BIC III has 3-year non-call period instead

The non-call period is one of the important considerations for senior tranche holders. As a deal matures and its WAL shortens, CLO tranches tend to price tighter, and hence a longer non-call protection is valuable for senior debt investors, especially for senior tranche investors. In other words, senior debt tranches would not be subject to

repricing risk in a credit spread tightening environment, at least until the expiry of the non-call period.

IABS have a longer non-call period and shorter reinvestment period, which compares favourably to the regular US and EU CLOs.

Most CLO deals would allow reinvestment post the end of the reinvestment period, subject to various reinvestment criteria. However, Bayfront's IABS, such as BIC II and BIC III, would not be able to replenish assets post its reinvestment period.

#### **(4) Concentration / Number of issuers**

The BIC III portfolio is highly concentrated as compared to US and EU CLOs. The BIC III portfolio only includes 28 loans relating to 26 projects, with considerable exposure to a few of them.

Having said that, Moody's has correlated loans at 100% for those that relate to the same projects or same loan guarantor so that when one of them defaults, all of them will default in the same simulation. This is important to ensure that the portfolio tail risk is captured correctly.

Another mitigant is that only 21% of the portfolio has a credit spread of over 3%, and less than 5% of the portfolio has a spread of over 4%. While the portfolio is highly concentrated, it is mitigated by higher credit quality as shown by its WARF, as well as its tight credit margin (spread).

	Gross Margin	% Exposure
Asset 1	4.25	4.8%
Asset 2	4.00	7.4%
Asset 3	3.40	6.2%
Asset 4	3.30	2.5%
Asset 5	2.95	5.0%
Asset 6	2.75	2.5%
Asset 7	2.60	5.0%
Asset 8	2.50	2.3%
Asset 9	2.39	1.2%
Asset 10	2.35	5.0%
Asset 11	2.35	2.5%
Asset 12	2.35	5.1%
Asset 13	1.90	2.0%
Asset 14	2.10	2.5%
Asset 15	2.05	3.1%
Asset 16	2.00	3.7%
Asset 17	1.90	7.4%
Asset 18	1.90	1.2%
Asset 19	1.80	3.3%
Asset 20	1.75	3.7%
Asset 21	1.75	3.7%
Asset 22	1.75	3.7%
Asset 23	1.55	5.5%



Asset 24	1.50	1.2%
Asset 25	1.50	1.9%
Asset 26	1.50	1.9%
Asset 27	1.30	2.5%
Asset 28	1.15	3.1%

Source: Intex

### **(5) Initial OC Test Cushion (BBB Tranche) %**

At 2.5%, BIC III OC test cushion for the most junior debt tranche is low as compared to US BSL and EU CLOs. Some debt investors might perceive this lower test cushion to be debt friendly, as the collateral manager would be more focused in preserving capital so as not to breach this threshold.

### **(6) Underlying collateral liquidity**

Unlike US BSL and EU CLOs, the underlying collateral assets of IABS are very illiquid with no readily quoted market prices given the nature of the asset class.

This could be a plus as this could translate to less market price volatility at the collateral level and at the IABS tranche levels.

### **(7) Covenants**

Now that cov-lite lending has become the norm in the leveraged loan market, what does that mean for recoveries?

According to S&P Global LossStats, looking at term loans issued after the Global Financial Crisis, and excluding second-lien facilities, cov-lite term loans have underperformed, recovering 66% on average, versus 73% for all loans issued over the same period.

On the other hand, IABS' collateral pools are comprised of loans with detailed covenant package including reserve accounts, dividend restrictions, debt service covenants with a high level of monitoring on performance.

## **Appendix 2**

### **Understanding Rating Agency's Approach to Rating IABS**

In Moody's credit analysis of IABS, they consider the attributes of the underlying assets, including the assets' average default probability, average recovery rate, asset correlation, loan participation exposure, average life, average spread, industry sectors and sub-sectors and geographical concentration.

Moody's measures the credit risk of the rated liability classes (rated notes) using a model, which calculates the Expected Loss (EL) for each rated tranche, which incorporates the default and recovery characteristics of the underlying assets. Any such model consists of two primary components:

- A mechanism for associating collateral default and loss scenarios with the likelihood that each such scenario will occur (analysed using Moody's CDOROM).
- A cash flow component that relates each collateral default scenario to the cash that flows to the rated notes within that scenario (analysed using Moody's CDOEdge).

Once Moody's has applied such collateral default scenarios to the cash flow model, it is possible to calculate the EL for each rated tranche. The final step is to compare the computed EL for each tranche to a set of benchmarks to determine the model output rating for the tranche.

Moody's idealised EL rates represent the benchmark ELs associated with each rating category over various time horizons (refer to [Appendix 3](#)). Moody's assesses the model output by comparing the note's calculated EL and weighted average life (WAL) to these benchmarks.

#### **Expected loss and modelling analysis**

Moody's applies the Monte Carlo simulation framework in CDOROM to model the portfolio loss distribution. The simulated defaults and recoveries for each of the Monte Carlo scenarios define the pool's loss distribution.

CDOEdge is a cash flow model focused more on the liability side (the notes). Moody's inputs pool default and recovery assumptions, which maintain the pool loss distribution generated by CDOROM. Other modelling assumptions – such as recovery delay, portfolio amortisation schedule and yield vector to the model, are used to estimate the expected losses on each tranche within a transaction. The CDOEdge model incorporates various scenarios for default timing and interest rate paths (5 different interest rate paths) and allocates the cash flow arising from the portfolio in accordance with the priority of payments stated in the transaction's documentation.

In practice, the collateral pool default distribution scenarios generated from CDOROM are aggregated into many different default buckets with an associated probability of occurrence. Each default scenario is then inputted into the CDOEdge model.

Moody's considers cases in which the defaults within a given scenario occur over the first six years of the transaction, with 50% of scenario defaults occurring in one year and 10% in each of the other years. The 50% default spike is intended to mimic the bunching of defaults in a recession. The spike is moved through each year for a total of six default-timing scenarios.

Please see below for some of the Moody's top-level modelling inputs for the Bayfront Infrastructure Capital III (BIC III) transaction that was issued in September 2022<sup>3</sup> (source: *Moody's New Issue Report on BIC III, dated 22 Sep 2022*):

Weighted average rating factor (WARF)\*: 901 (before credit estimate notching adjustment) / 1,041 (after credit estimate notching adjustment)

- Credit estimate adjustment: Moody's applies a two-notch haircut on credit estimates related to the largest loans representing 30% of the pool. This adjustment is primarily to account for the unmonitored nature of credit estimates<sup>4</sup> (hence, credit estimates are subject to potentially higher volatility than ratings) and also the fact that credit estimates are typically assigned based on limited analyses compared to those for ratings. Moody's expects to review the credit estimates as the collateral manager requests and at least once every 12 months from each of the last assignment dates.

\*Based on the new/current WARF disclosure regime. Previously, Moody's credit estimates for covered loans incorporated the full loss-given-default benefit from the external credit support. Under the updated approach, the benefit of external credit support is recognized solely in the recovery assumptions made outside of the credit estimates. Nonetheless, this updated approach does not change the risk profile of the underlying loan portfolio (i.e., each loan's default probability and ultimate loss-given-default) and does not change the rating analysis.

Weighted average life (WAL in years): 5.6 years

- This is to recognise the fact that BIC III is largely a static deal as reinvestment is only allowed during the replenishment period.

Asset correlation: 28% (on average)

- This average asset correlation number has captured the intra-sector and inter-sector pairwise asset correlation as well as adjustment for different continental regions and countries.

Weighted average recovery rate (WARR): 70%

- The weighted average recovery rate captures factors that determine recovery rates such as sector classification, the relevance of construction phase of the underlying project, and the degree of government support. Moody's does consider a higher recovery rate assumption for certain assets, such as availability-based projects in operational phase or in advanced stages of construction phase if they exhibit features such as exceptional levels of support from highly rated off-takers and lower-than-typical operating risk. Project loans that benefit from meaningful external credit support, for instance from export credit agencies (ECAs) or multilateral

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<sup>3</sup> Source: *Moody's New Issue Report on BIC III, dated 22 Sep 2022*

<sup>4</sup> Credit estimates represent a point-in-time estimate by the rating agency on the creditworthiness of the obligor and are typically refreshed only annually or in cases of material changes, whereas public ratings are meant to be dynamic representations of creditworthiness and are constantly monitored by the rating agency.

financial institutions (MFIs), would also warrant a higher recovery rate assumption.

- The WARR is 95% for covered loans and 66% for uncovered loans within the portfolio.

The EL for each tranche is simply the weighted average of losses allocated to each tranche across all the scenarios, where the weight is the likelihood of the scenario occurring.

The EL of a tranche is associated with a particular horizon to compare the EL to Moody's benchmark for that horizon. The relevant horizon is the WAL of the tranche. The model output reflects the comparison of the calculated EL for each liability to a set of benchmarks that represent the target EL for a given rating level and average life (please see [Appendix 3](#)).

Moody's considers stress scenarios assuming higher asset correlation or by notching down the credit estimates on a portion of the pool in which the projects are expected to be more susceptible to declining commodity prices.

Moody's also considers other stress scenarios assuming generally higher asset correlation across the entire pool. Moody's determines that the potential rating volatility of the notes under these scenarios is acceptable when assigning the tranche ratings.

#### Moody's Default Probability Ratings vs. Moody's Rating Factors

Moody's Default Probability Rating	Moody's Rating Factor	Moody's Default Probability Rating	Moody's Rating Factor
<b>Aaa</b>	1	<b>Ba1</b>	940
<b>Aa1</b>	10	<b>Ba2</b>	1350
<b>Aa2</b>	20	<b>Ba3</b>	1766
<b>Aa3</b>	40	<b>B1</b>	2220
<b>A1</b>	70	<b>B2</b>	2720
<b>A2</b>	120	<b>B3</b>	3490
<b>A3</b>	180	<b>Caa1</b>	4770
<b>Baa1</b>	260	<b>Caa2</b>	6500
<b>Baa2</b>	360	<b>Caa3</b>	8070
<b>Baa3</b>	610	<b>Ca, C</b>	10000

Source: Moody's Investors Service

Moody's Idealized Cumulative Expected Default Rates

Rating factor			Year									
			1	2	3	4	5	6	7	8	9	10
0	1	Aaa	0.0001%	0.0002%	0.0007%	0.0018%	0.0029%	0.0040%	0.0052%	0.0066%	0.0082%	0.0100%
1	10	Aa1	0.0006%	0.0030%	0.0100%	0.0210%	0.0310%	0.0420%	0.0540%	0.0670%	0.0820%	0.1000%
2	20	Aa2	0.0014%	0.0080%	0.0260%	0.0470%	0.0680%	0.0890%	0.1110%	0.1350%	0.1640%	0.2000%
3	40	Aa3	0.0030%	0.0190%	0.0590%	0.1010%	0.1420%	0.1830%	0.2270%	0.2720%	0.3270%	0.4000%
4	70	A1	0.0058%	0.0370%	0.1170%	0.1890%	0.2610%	0.3300%	0.4060%	0.4800%	0.5730%	0.7000%
5	120	A2	0.0109%	0.0700%	0.2220%	0.3450%	0.4670%	0.5830%	0.7100%	0.8290%	0.9820%	1.2000%
6	180	A3	0.0389%	0.1500%	0.3600%	0.5400%	0.7300%	0.9100%	1.1100%	1.3000%	1.5200%	1.8000%
7	260	Baa1	0.0900%	0.2800%	0.5600%	0.8300%	1.1000%	1.3700%	1.6700%	1.9700%	2.2700%	2.6000%
8	360	Baa2	0.1700%	0.4700%	0.8300%	1.2000%	1.5800%	1.9700%	2.4100%	2.8500%	3.2400%	3.6000%
9	610	Baa3	0.4200%	1.0500%	1.7100%	2.3800%	3.0500%	3.7000%	4.3300%	4.9700%	5.5700%	6.1000%
10	940	Ba1	0.8700%	2.0200%	3.1300%	4.2000%	5.2800%	6.2500%	7.0600%	7.8900%	8.6900%	9.4000%
11	1350	Ba2	1.5600%	3.4700%	5.1800%	6.8000%	8.4100%	9.7700%	10.7000%	11.6600%	12.6500%	13.5000%
12	1766	Ba3	2.8100%	5.5100%	7.8700%	9.7900%	11.8600%	13.4900%	14.6200%	15.7100%	16.7100%	17.6600%
13	2220	B1	4.6800%	8.3800%	11.5800%	13.8500%	16.1200%	17.8900%	19.1300%	20.2300%	21.2400%	22.2000%
14	2720	B2	7.1600%	11.6700%	15.5500%	18.1300%	20.7100%	22.6500%	24.0100%	25.1500%	26.2200%	27.2000%
15	3490	B3	11.6200%	16.6100%	21.0300%	24.0400%	27.0500%	29.2000%	31.0000%	32.5800%	33.7800%	34.9000%
16	4770	Caa1	17.3816%	23.2342%	28.6386%	32.4788%	36.3137%	38.9667%	41.3854%	43.6570%	45.6718%	47.7000%
17	6500	Caa2	26.0000%	32.5000%	39.0000%	43.8800%	48.7500%	52.0000%	55.2500%	58.5000%	61.7500%	65.0000%
18	8070	Caa3	50.9902%	57.0088%	62.4500%	66.2420%	69.8212%	72.1110%	74.3303%	76.4853%	78.5812%	80.7000%
19	10000	Ca	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%
20	10000	C	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%

**Appendix 3**

Moody's Idealized Cumulative Expected Loss Rates

Rating factor			Year														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	1	Aaa	0.0000%	0.0001%	0.0004%	0.0010%	0.0016%	0.0022%	0.0029%	0.0036%	0.0045%	0.0055%	0.0067%	0.0079%	0.0093%	0.0107%	0.0122%
1	10	Aa1	0.0003%	0.0017%	0.0055%	0.0116%	0.0171%	0.0231%	0.0297%	0.0369%	0.0451%	0.0550%	0.0719%	0.0876%	0.1051%	0.1241%	0.1449%
2	20	Aa2	0.0007%	0.0044%	0.0143%	0.0259%	0.0374%	0.0490%	0.0611%	0.0743%	0.0902%	0.1100%	0.1371%	0.1674%	0.2009%	0.2376%	0.2776%
3	40	Aa3	0.0017%	0.0105%	0.0325%	0.0556%	0.0781%	0.1007%	0.1249%	0.1496%	0.1799%	0.2200%	0.3540%	0.4199%	0.4909%	0.5668%	0.6473%
4	70	A1	0.0032%	0.0204%	0.0644%	0.1040%	0.1436%	0.1815%	0.2233%	0.2640%	0.3152%	0.3850%	0.5709%	0.6723%	0.7808%	0.8958%	1.0169%
5	120	A2	0.0060%	0.0385%	0.1221%	0.1898%	0.2569%	0.3207%	0.3905%	0.4560%	0.5401%	0.6600%	0.7877%	0.9248%	1.0707%	1.2249%	1.3866%
6	180	A3	0.0214%	0.0825%	0.1980%	0.2970%	0.4015%	0.5005%	0.6105%	0.7150%	0.8360%	0.9900%	1.2826%	1.4738%	1.6732%	1.8799%	2.0929%
7	260	Baa1	0.0495%	0.1540%	0.3080%	0.4565%	0.6050%	0.7535%	0.9185%	1.0835%	1.2485%	1.4300%	1.7773%	2.0226%	2.2755%	2.5347%	2.7991%
8	360	Baa2	0.0935%	0.2585%	0.4565%	0.6600%	0.8690%	1.0835%	1.3255%	1.5675%	1.7820%	1.9800%	2.2719%	2.5714%	2.8778%	3.1895%	3.5052%
9	610	Baa3	0.2310%	0.5775%	0.9405%	1.3090%	1.6775%	2.0350%	2.3815%	2.7335%	3.0635%	3.3550%	4.2333%	4.6683%	5.1006%	5.5286%	5.9513%
10	940	Ba1	0.4785%	1.1110%	1.7215%	2.3100%	2.9040%	3.4375%	3.8830%	4.3395%	4.7795%	5.1700%	6.1940%	6.7647%	7.3228%	7.8671%	8.3966%
11	1350	Ba2	0.8580%	1.9085%	2.8490%	3.7400%	4.6255%	5.3735%	5.8850%	6.4130%	6.9575%	7.4250%	8.1547%	8.8610%	9.5449%	10.2055%	10.8419%
12	1766	Ba3	1.5455%	3.0305%	4.3285%	5.3845%	6.5230%	7.4195%	8.0410%	8.6405%	9.1905%	9.7130%	10.7874%	11.5936%	12.3605%	13.0890%	13.7806%
13	2220	B1	2.5740%	4.6090%	6.3690%	7.6175%	8.8660%	9.8395%	10.5215%	11.1265%	11.6820%	12.2100%	13.4192%	14.3255%	15.1752%	15.9717%	16.7185%
14	2720	B2	3.9380%	6.4185%	8.5525%	9.9715%	11.3905%	12.4575%	13.2055%	13.8325%	14.4210%	14.9600%	16.0511%	17.0573%	17.9899%	18.8544%	19.6564%
15	3490	B3	6.3910%	9.1355%	11.5665%	13.2220%	14.8775%	16.0600%	17.0500%	17.9190%	18.5790%	19.1950%	20.6128%	21.9203%	23.1321%	24.2555%	25.2976%
16	4770	Caa1	9.5599%	12.7788%	15.7512%	17.8634%	19.9726%	21.4317%	22.7620%	24.0113%	25.1195%	26.2350%	27.4851%	28.6344%	29.6671%	30.5988%	31.4428%
17	6500	Caa2	14.3000%	17.8750%	21.4500%	24.1340%	26.8125%	28.6000%	30.3875%	32.1750%	33.9625%	35.7500%	36.6485%	37.4049%	38.0482%	38.6010%	39.0808%
18	8070	Caa3	28.0446%	31.3548%	34.3475%	36.4331%	38.4017%	39.6611%	40.8817%	42.0669%	43.2196%	44.3850%	44.8962%	45.3571%	45.7455%	46.0766%	46.3621%
19	10000	Ca	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%	55.0000%
20	10000	C	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%	100.0000%

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