Loss Given Default (LGD) in Aircraft Transactions:

2023 AWG Basel Data Exercise Update*

Vadim Linetsky, Ph.D.
Professor, Northwestern University
Independent Technical Advisor, AWG

January 2024

*__Disclaimer:__ Any opinions, findings, conclusions or recommendations expressed in this material are those of the author, Prof. Linetsky, expressed in his private individual capacity, do not necessarily reflect the views of the AWG or its individual members, Northwestern University, or any other 3rd parties, and are based on research and analysis completed to date and subject to change as additional data become available. No warranty or liability of any kind is assumed.

Background: 2016 AWG LGD Study

- In 2016 **AWG** released a paper "Regulatory Capital Treatment of Aircraft-Backed Loans" (the **LGD study**) that studied and drew policy conclusions from the historically low LGD for aircraft-backed loans: http://awg.aero/wp-content/uploads/2021/05/October-2016-study-on-Regulatory-Capital-Treatment-of-Aircraft-Backed-Loans.pdf

- AWG also released a **summary PPT** setting out the "Unique Features and Data Supporting Low LGDs for Aircraft-Backed Loans": http://awg.aero/wp-content/uploads/2019/09/Basel-unique-features-and-data-supporting-low-LGDs-for-aircraft-backed-1.pdf These documents were submitted to the Basel Committee on Banking Supervision (**Basel**) in connection with its 2015 and 2016 proposals on credit risky assets and its constraints on the use of internal models.

- Final revised Basel rules released in **December 2017: Basel III Finalizing Post-Crisis Reforms** https://www.bis.org/bcbs/publ/d424.pdf

Background: Final Basel III Rules and Aircraft Loans

- **(1)** Final Basel rules allow banks to **retain Advanced Internal Ratings Based (A-IRB) approach for specialized lending / object finance** relevant to aircraft finance. This is in contrast to earlier proposals that sought to discontinue A-IRB.

- **(2)** The benefits of retaining A-IRB for aircraft finance are **diluted** by the **LGD Parameter Floor** set at **15% for physical collateral** (**unsecured corporate exposure LGD parameter floor is set at 25%**).

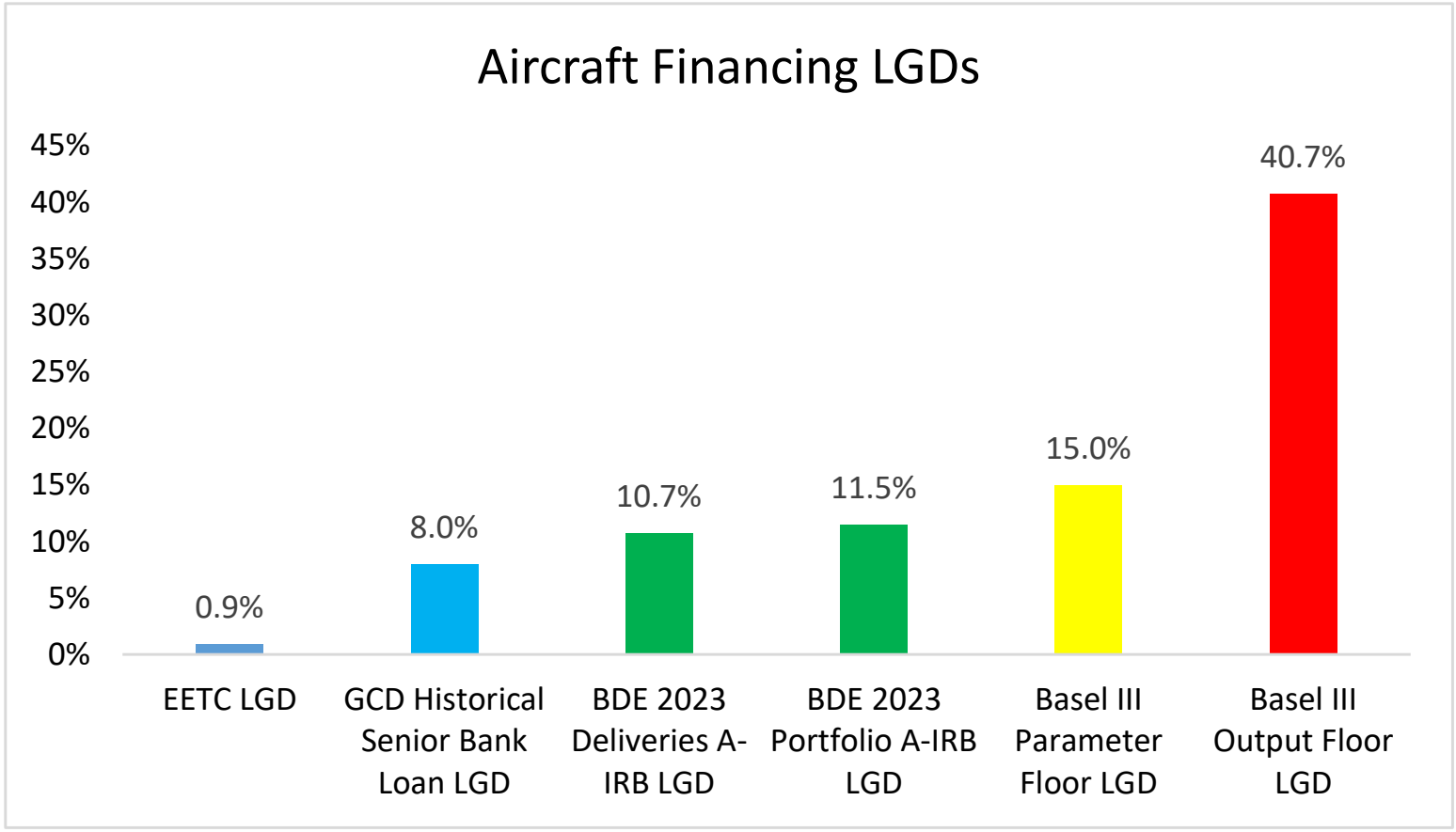
- **(3)** Further, the benefits of A-IRB for aircraft finance could be further **reduced** by the application of the **Output Floor on Risk Weighted Assets (RWA)** at the bank level, **depending on the specifics of its implementation in the banking practice**. The output floor, after the phase-in period, reverts to 72.5% of the Standardized Approach RWA, set at 100% for specialized lending. Resulting in **RWAs with the output floor for specialized lending potentially increasing to 72.5% if fully implemented.**

Executive Summary

- Aircraft backed financings historically realized strong recoveries and low LGDs:
  - Capital markets: According to Kroll (2015) study updated through 2023, historical LGD for all EETC A and B tranches combined (A+B LTV comparable to bank loans) is **0.89%**.
  - Bank loans: historical average senior secured aircraft bank loan LGD is **8%**. (Based on 2023 Global Credit Data study)
- 2023 AWG Basel Data Exercise (BDE) According to global banks active in the aircraft sector:
  - For aircraft bank loans newly funded in 2023: average modeled A-IRB **LGD: 10.7%**, average **RWA: 17.1%**.
  - For aggregate aircraft bank loan portfolios: average A-IRB **LGD: 11.5%**, average **RWA: 17.9%**.
- The anticipated impact of Basel III on capital requirements in the aircraft sector, if fully implemented, is 1.5x to 4x increase in Tier 1 capital requirements on secured aircraft loans due to the LDG parameter floor and the RWA output floor, respectively.
- Impact of Basel III on availability of bank financing and risk profile in the aircraft sector: By not recognizing the historically low risk of aircraft collateral due to the LGD parameter floor and the RWA output floor, Basel III puts secured aircraft loans at a material risk-return profile disadvantage relative to higher risk unsecured corporate loans and secured loans with other types of collateral that historically realized higher LGDs. Within the aircraft sector, Basel III puts lower risk aircraft loans at a disadvantage relative to higher risk loans. According to the BDE respondents, consequences will likely include:
  - Reduced capital availability to secured aircraft lending.
  - Reduce size of low risk aircraft loan portfolios on banking books via possible asset sales, undermining the long term partner role played by banks aligned with their airline customers.
  - Overall increase in bank portfolio risk through re-allocating capital away from secured aircraft lending towards riskier unsecured lending and riskier types of collateral.
  - Some aircraft financing may shift towards unregulated shadow banking entities.
  - Remaining secured aircraft financing in banks may shift to riskier terms and borrowers to capture higher margins to compensate for increased regulatory capital costs that are made essentially risk-insensitive by the current BCBS proposals.

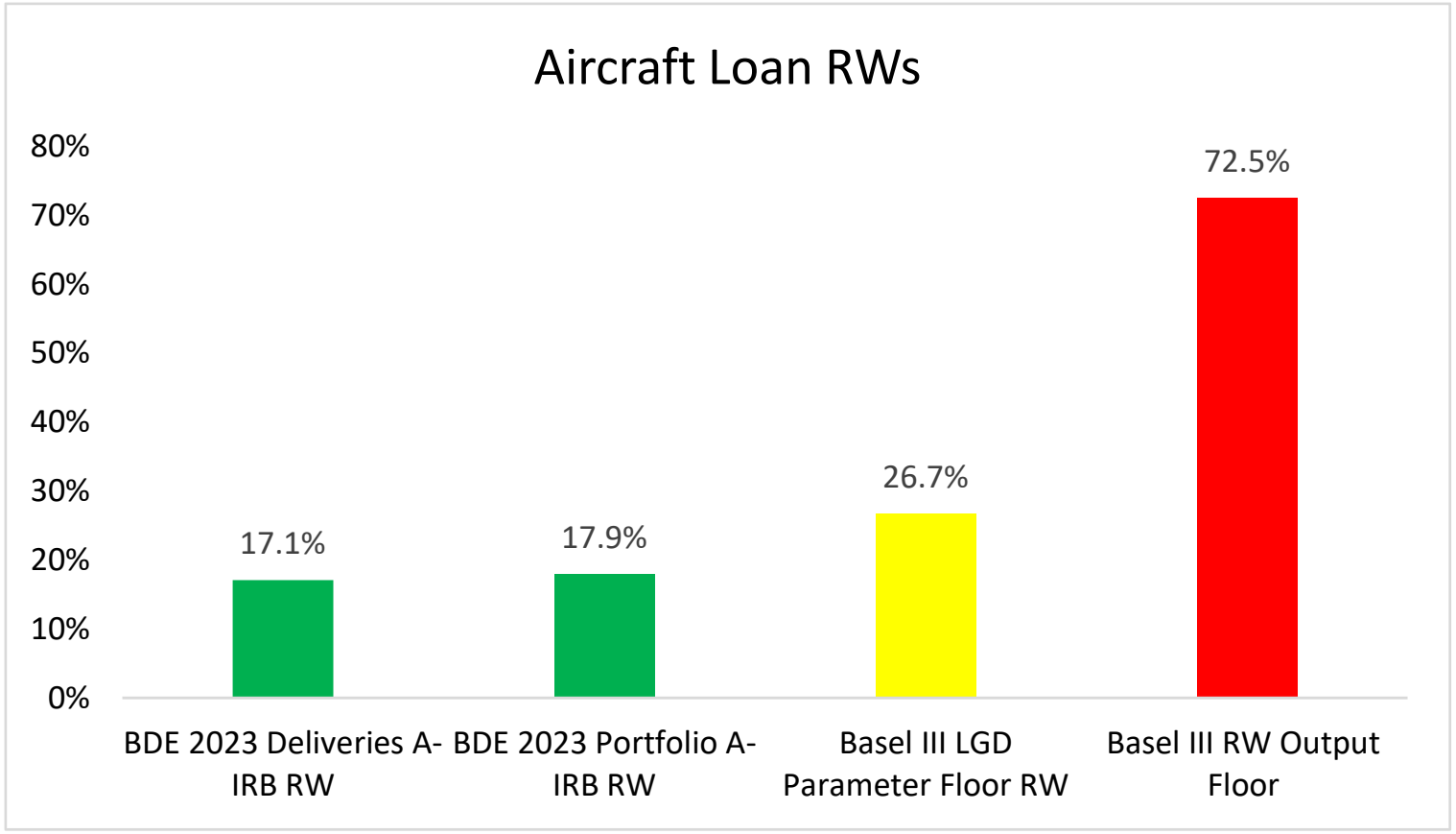
Aircraft Financing LGDs

The summary chart shows historical EETC combined A and B tranche LGD, historical senior secured loan LGD in the GCD database, average current (2023 deliveries) A-IRB modeled LGD across BDE participants, average portfolio A-IRB modeled LGD across BDE participants, Basel III LGD parameter floor (15%), and LGD that corresponds to the Basel III Output Floor RWAs of 72.5% using average portfolio parameters of BDE participants (40.7%).



Aircraft Loan RWs

The summary chart shows average current (2023 deliveries) A-IRB modeled RWs across BDE participants, average portfolio A-IRB modeled RWs across BDE participants, RW corresponding to the Basel III 15% LGD parameter floor, and the Basel III RW Output Floor of 72.5%.



2023 AWG Basel Data Exercise Details

- A group of major global banks currently using A-IRB approaches returned confidential AWG BDE questionnaires. These banks, collectively, have a substantial market share of aircraft backed loans and are representative of currently active aircraft lenders using A-IRB. The majority of respondents are Global Systemically Important Banks (G-SIBs).
- AWG BDE questionnaire was intended to establish average LGD and RWA for first priority aircraft-backed loans currently in use by banks in their regulator-approved A-IRB calculations. It asked for average figures for aircraft-backed loans funded **during the 2023 period (current LGD and RWA)**, as well as for the bank's entire **portfolio of aircraft-backed loans (portfolio LGD and RWA)**.

AWG BDE Results	2023
Average Potrfolio LGD	11.5%
Average Potrfolio RWA	17.9%
Average Current LGD	10.7%
Average Current RWA	17.1%

2023 AWG Basel Data Exercise: Comparison with 2016

- 2023 LGDs slightly increased relative to 2016, likely reflecting some lingering impact of the Covid-19 pandemic.
- 2023 RWA slightly decreased relative to 2016.
- The RWA A-IRB formula is linear in LGD with the coefficient of proportionality that involves a number of other inputs, notably probability of default (PD) and effective maturity. We hypothesize that a slight decrease in RWA in the face of a slight increase in LGD is due to some shortening of effective maturities observed in the aftermath of the Covid-19 pandemic, as well as some increase in the quality of bank portfolios (decrease in PDs) due to more conservative underwriting.

AWG BDE Results	2023	2016
Average Potrfolio LGD	11.5%	8.8%
Average Potrfolio RWA	17.9%	19.7%
Average Current LGD	10.7%	7.9%
Average Current RWA	17.1%	19.0%

Historical Bank Loan LGDs: Global Credit Data Study

- Prof. Linetsky worked with the **Global Credit Data (GCD)** to analyze the GCD's historical database of defaulted bank loans going back to 2000.

- The GCD is a consortium of global banks (55 member banks as of 2019) that contribute data on their defaulted facilities to the GCD database https://globalcreditdata.org/

- Our GCD data extraction included all **first lien loans with commercial aircraft collateral** that experienced a default event and which were resolved and reported to the GCD by the GCD member banks between 2000 and June 2023: **475 defaulted facilities in total** collateralized by commercial aircraft.

- **The average senior aircraft-secured bank loan LGD is 8%. The median LGD is 0%.** Majority of defaulted loans resulted in full recovery (0% median), while minority of defaulted loans experienced larger LGDs, resulting in the 8% average across 475 facilities.

Comparison of AWG BDE Figures with GCD Historical Figures

- To compare the **historical GCD LGD figure of 8%** with the average reported **modeled portfolio A-IRB LGD of 11.5%** in the 2023 AWG BDE, we note that these figures are of a different nature.
- The average 11.5% A-IRB LGD in the current bank portfolios represents banks' modeled stressed LGDs for the current portfolio, also taking into account the bank's historical data, relative to the actual realized GCD data LGDs. Current portfolios may have a significantly different risk profile relative to the historical data in the GCD database, such as aircraft age and type, loan LTV, maturity and amortization profile, and borrower PDs. Since the financial crisis of 2007-2008, banks have worked to reduce portfolio risk. It is likely that the current bank portfolio risk profiles are lower than the risk profile in the historical data.
- Additionally, the groups of banks in the AWG BDE and in the GCD are not the same (while some of the banks participated in both data collection exercises, some participated in only BDE or only GCD).
- We also note that realized secured aircraft loan LGDs are generally low due to the residual life of the aircraft which enables lenders to restructure the loan with the same operator or re-position the aircraft with another operator, thus avoiding sale of the aircraft in unfavorable market environments.

Capital Markets: EETC LGDs

- Kroll Bond Rating Agency ("EETC historical recoveries and current outlook", September 2015) conducted a comprehensive study into EETC recoveries in bankruptcy during 1994-2014.
- Typical bank loan LTVs are broadly comparable to B tranche LTVs (A tranche LTVs are generally lower than bank loan LTVs, C tranche LTVs are generally higher). This study uses combined A and B tranche EETC financing as proxy for bank loans.
- $19.3bn in face value of combined A and B tranches issued by US airlines went through bankruptcy proceedings during the 1994-2014 period. Aggregate losses on this issuance totaled $162mn during this period, for an **LGD of 0.84%** --- exceptionally low historical loss rates, considering that this historical period included high-stress periods for the airline industry (airline industry downturn following the 9/11 terrorist attacks, high jet fuel costs of 2006-2008, and the financial crisis of 2008 and the subsequent recession).
- **Two EETC bankruptcies since 2015 Kroll study: LATAM 2015-1 and Norwegian 2016-1 in the aftermath of the Covid-19 pandemic in 2020. A+B LGD 0% LATAM, 6% Norwegian.**

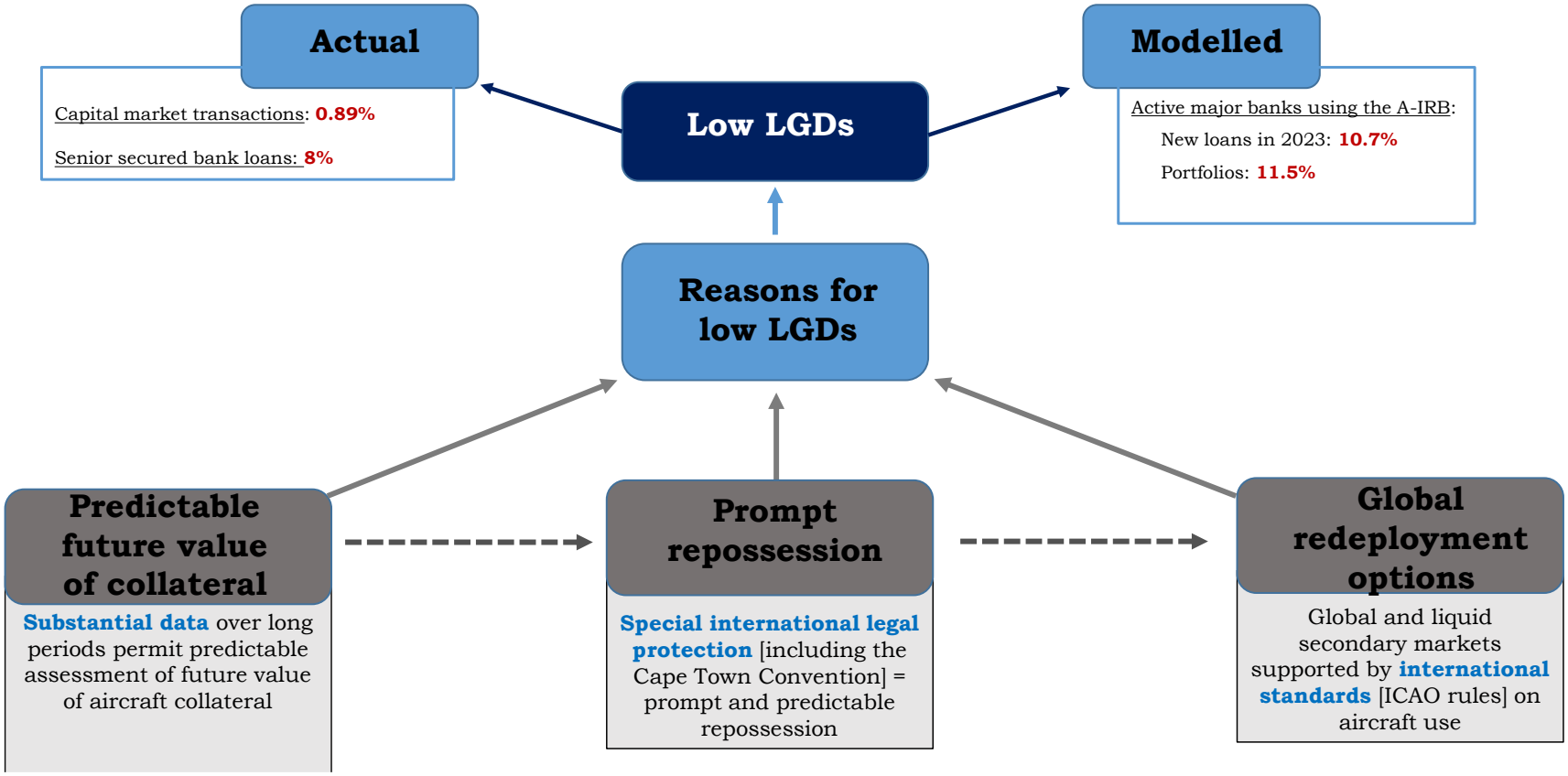
LATAM 2015-1			
	A	B	A+B
Principal (mn)	845.2	175.6	1020.8
Recovery (mn)	845.2	175.5	1020.709
LGD (%)	0%	0%	0%
Norwegian 2016-1			
Principal (mn)	274.3	74.8	349.1
Recovery (mn)	274.3	52.4	326.66
LGD (%)	0%	30%	6%

Capital Markets: EETC LGDs

- Updated LGD data Kroll (2015) plus LATAM and Norwegian bankruptcies – all A and B EETC issues 1994 - 2023.
- **Updated A+B EETC LGD 0.89%.**

Loss and Recovery Rates for EETCs in Bankruptcy 1994-2023				
Tranche	Total loss (mn)	Original Face (mn)	LGD	Recovery*
A	$ 35	$ 17,119	0.20%	99.80%
B	$ 150	$ 3,551	4.21%	95.79%
A+B	$ 185	$ 20,670	0.89%	99.11%

Unique features and data supporting low LGDs for aircraft-backed loans



Impact of the Covid-19 Pandemic

- BDE participants indicated that *modeled* LGDs and RWAs in banks' A-IRB calculations sharply increased during the early stages of the Covid-19 pandemic and peaked around the 3rd quarter of 2020.
- Modeled LGDs and RWAs then steadily decreased and stabilized around 20% to 30% higher currently than the pre-Covid 19 pandemic levels.
- The GCD reported that the COVID-19 pandemic has resulted in higher number of defaults compared to previous years. However, the LGD pandemic data is incomplete, as it comprises only quick recoveries and cures, with a number of defaults still unresolved and/or not yet reported to the GCD as of the time of the data extraction (June 2023). The **recovery rate for the resolved pandemic default data stands at 100% (LGD of 0%) in the GCD database**, but it is anticipated to decrease (**LGD to increase**) due to longer workout periods for the remaining defaults yet to be resolved and reported to the GCD database (**resolution bias**).
- **The EETC market saw two Covid-19 related bankruptcies** LATAM 2015-1 and Norwegian 2016-1. LATAM and Norwegian A and B classes combined saw 100% and 94% recovery, respectively. C classes currently in litigation.

Adverse Consequences of Basel III on the Aircraft Sector

- While the stated intent of the BCBS's proposals is reduction in variation in RWAs across different financial institutions, rather than material net increases in regulatory capital requirements across the banking industry, the impact of the **LGD parameter floor** and, especially, the **RWA output floor** on the aircraft sector *specifically* is an increase of **1.5x and 4x (due to the LGD parameter floor and RWA output floor, respectively) in capital requirements on secured aircraft loans** that, if implemented, would require the banking industry to **raise substantial amounts in new equity** to support the *existing* aircraft loan banking books and sustain the historical bank market share in new aircraft delivery financing *going forward*.
- In addition to the *net* increases in regulatory capital to the aircraft sector, the LGD parameter floor and the RWA output floor are *insensitive to the risk spectrum within the aircraft sector*. LGDs on aircraft loans strongly depend on transaction characteristics such as age of aircraft, LTV, maturity, amortization profile, legal jurisdiction.
- AWG BDE respondents indicated that outcomes of the increases in capital requirements (*especially due to the RWA output floor*) for secured aircraft financing will range from some of the institutions considering exiting the secured aircraft financing market due to disproportionate increases in capital requirements relative to other sectors, while some of the institutions considering reducing the size of existing aircraft books via possible asset sales and scaling back new financings.
- By not recognizing the historically low risk of aircraft collateral, the LGD parameter floor and the RWA output floor put secured aircraft loans at a risk-return profile disadvantage relative to higher risk unsecured corporate loans and secured loans with other types of collateral that historically realized higher LGDs. Within the aircraft sector, the Basel III parameter and output floors put lower risk aircraft loans at a disadvantage relative to higher risk loans (riskier borrowers, higher LTVs). According to the BDE respondents, consequences will likely include:
  - Reduced capital availability to secured aircraft lending.
  - Reduce size of low risk aircraft loan portfolios on banking books via possible asset sales, undermining the long term partner role played by banks aligned with their airline customers.
  - Overall increase in bank portfolio risk through re-allocating capital away from secured aircraft lending towards riskier unsecured lending and riskier types of collateral.
  - Some aircraft financing may shift towards unregulated shadow banking entities that are possibly less concerned with the long-term health of the aviation industry.
  - Remaining secured aircraft financing in banks may shift to riskier terms and borrowers to capture higher margins to compensate for increased regulatory capital costs that are made essentially risk-insensitive by the current BCBS proposals.