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U.K. Mortgage Market Expectations: A Midsummer Night's Dream or Nightmare?

INTRODUCTION

In this paper, we assess the impact of the COVID-19 pandemic on a representative U.K. mortgage portfolio. We start with the economic outlook, which incorporates the lifting of the U.K. government restrictions, expected to be removed completely shortly before Midsummer Day in June. We characterize additional economic stress using the stress scenario published by the Prudential Regulation Authority in January 2021. We construct a synthetic portfolio that assigns a delinquency payment status to accounts whose balance has not declined. We compare attributes of the borrowers in this portfolio after the first lockdown in June 2020 and then after the second lockdown in December 2020. Finally, we deploy the Moody's Analytics U.K. Mortgage Portfolio Analyzer to generate the projections of risk parameters such as probability of default, loss given default, and expected and unexpected losses under the Moody's Analytics baseline and the PRA stress scenarios for the standard portfolio and the synthetic portfolio.

U.K. Mortgage Market Expectations: A Midsummer Night's Dream or Nightmare?

BY CHIARA VENTURA AND PETR ZEMCIK

In this paper, we assess the impact of the COVID-19 pandemic on a representative U.K. mortgage portfolio. We start with the economic outlook, which incorporates the lifting of the U.K. government restrictions, expected to be removed completely shortly before Midsummer Day in June. We characterize additional economic stress using the stress scenario published by the Prudential Regulation Authority in January 2021. We construct a synthetic portfolio that assigns a delinquency payment status to accounts whose balance has not declined. We compare attributes of the borrowers in this portfolio after the first lockdown in June 2020 and then after the second lockdown in December 2020. Finally, we deploy the Moody's Analytics U.K. Mortgage Portfolio Analyzer to generate the projections of risk parameters such as probability of default, loss given default, and expected and unexpected losses under the Moody's Analytics baseline and the PRA stress scenarios for the standard portfolio and the synthetic portfolio.

Economic outlook for the U.K.

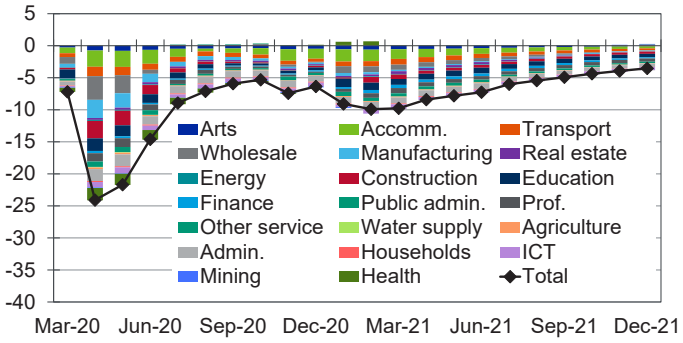
We formulate the economic forecast while taking into account the gradual lifting of the pandemic-related restrictions by the U.K. government. The roadmap was set by the prime minister on February 22.[1] The schools opened on March 8. Limited changes occurred from March 29, as two households or a group of six people can now meet outdoors. On April 12 or later, nonessential retail will reopen. On May 17 or later, most social restrictions will no longer apply, although large gatherings of more than 30 people will still be prohibited. Finally, no earlier than on June 21, all legal restrictions will be lifted. Midsummer Day is traditionally on June 24. Following a triple-dip recession (see Chart 1), Moody's Analytics forecasts a gradual recovery, although output will likely remain below pre-pandemic levels for the rest of 2021.

The Coronavirus Job Retention Scheme was extended in early March, when U.K. finance minister Rishi Sunak announced the 2021 budget plan. The deadline for the furlough scheme was pushed until the end of September. Although the economy should be in a more rooted recovery by then, we still expect a further rise in the jobless rate. Many companies will likely go bankrupt as the government support finishes, and the labour market will not be able to absorb all employees currently under furlough. HM Treasury estimated that the number of furloughed employees rose to 4.7 million at the end of January from 4 million at the end of 2020. This represents around 14% of the total employment level. The unemployment rate reached 5.4% by the end of the fourth quarter of 2020 (see Table 1). We expect it to reach 7.8% by the end of the year. Although U.K. output has been hit hard by the pandemic and the required lockdowns, the unemployment rate has remained relatively low thanks to the government support scheme. The U.K. has done relatively well compared with peers such as Germany and France, despite a greater hit to output. Unemployment was much higher in the Southern European economies prior to the pandemic and has remained high.

The U.K. was slow to introduce restrictions three times during the pandemic with

Chart 1: Gradual Recovery on the Horizon

Deviation from normal level of activity, ppts, by industry, Mar forecast



Source: Moody's Analytics

1 https://www.gov.uk/government/news/prime-minister-sets-out-roadmap-to-cautiously-ease-lockdown-restrictions, retrieved on March 28, 2021.

Table 1: Unemployment Increases

Unemployment rate projections, %

Country	Unemployment in 2020Q4	Max of 2021-2023 unemployment (Jan 2021)	
		Value	Date
Germany	6.14	6.13	2021Q2
U.K.	5.41	7.78	2021Q4
France	9.53	10.49	2021Q2
Greece	18.12	18.94	2021Q1
Spain	17.02	17.38	2021Q2
Italy	10.1	11.59	2021Q4
Netherlands	4.32	6.43	2021Q4
Portugal	7.97	8.35	2021Q2
Russian Federation	6.52	6.7	2021Q1
Poland	5.96	6.49	2021Q3
U.S.	6.77	6.47	2021Q1

Source: Moody's Analytics

subsequent lockdowns being required to contain the pandemic. However, it has been successful in securing a portfolio of vaccines early on and vaccinating the population rapidly. As of April 10, the number of people who have received the first dose of vaccine was 32,121,353 and the second dose 7,466,540.[2] The successful vaccination rollout has lowered the number of newly infected people, deaths, and hospital admissions (see Chart 2). The adult population is expected to receive the first dose of the vaccine by the end of July, despite issues with the vaccine supply.

Moody's Analytics baseline forecast and the PRA 2021 stress scenario

The PRA published its annual stress test on January 20. In contrast to previous years, it did not include a baseline forecast as part of the stress-testing exercise. As the scenario was published early in the year, we compare it with the Moody's Analytics baseline forecast from January this year and with the Moody's Analytics S4 scenario, which represents a 1-in-25 type of recession (see Chart 3). In a recession with this severity, the economic performance is worse only in 4% of the possible outcomes. The output is normalized to be 100 in the fourth quarter of 2020, as the scenario stress begins in the first quarter of 2021. Because of the strict lockdown imposed on January 4, the output was expected to decline in the first quarter in any case. The decline is more pronounced in the stress scenarios. The PRA stress scenario is moderately more severe than the S4 scenario initially, but the recovery is faster.

We define the severity of the stress by looking at the average deviation of the GDP level from the baseline forecast over three years (12 quarters). The PRA scenario is between the S4 and S3 scenarios, and S3 denotes a 1-in-10 type of recession (see Chart 4). In this case, 10% of 10,000 output simulations over the next three years have an average deviation from the baseline greater than in the S3 scenario. This number is 4% for the S4 scenario.

In contrast to the GDP path, the house price index decline in the PRA stress scenario is greater than in the Moody's Analytics S4 scenario (see Chart 5). Here, the clear intention of the PRA scenario is to provide a significant stress to the U.K. mortgage portfolios. In terms of the actual outlook, the U.K. government has been supporting housing demand via a temporary cut to the stamp duty tax. This was extended until June and involves a government guarantee of loans with a loan-to-value ratio of 95% or more. The housing market has defied expectations so far, and the Moody's Analytics baseline forecasts an increase in house prices by the end of 2021.

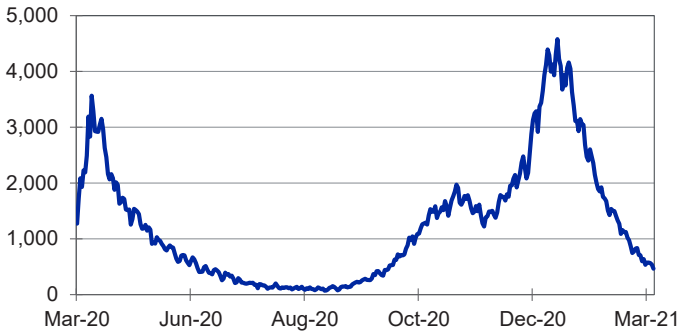
Payment holidays and U.K. mortgages

In response to the economic damage caused by the COVID-19 pandemic, the U.K. government implemented a set of schemes to financially support citizens and companies in economic distress. Among these measures, the Financial Conduct Authority published a guidance on consumer credit (mortgages, credit cards and loans) related to payment deferrals in April 2020. The guidance was then updated in July 2020 and again in September 2020. At the time of writing, the Payment Deferral Guidance continues to provide support for those hit by the coronavirus crisis until July 31, 2021, with an application deadline of March 31, 2021. This section of the

2 See https://coronavirus.data.gov.uk/details/vaccinations, retrieved on April 11, 2021.

Chart 2: U.K. Hospitalizations Decline

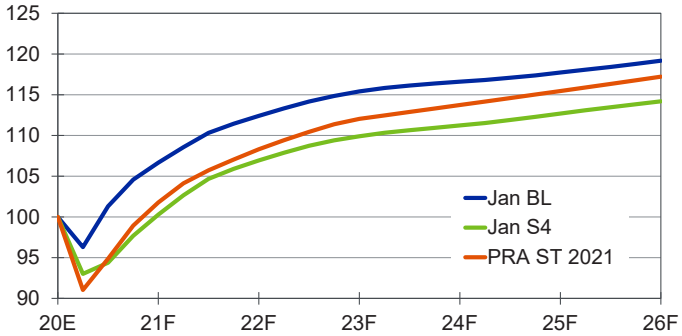
Number of patients admitted to hospital



Sources: Public Health of England, Moody's Analytics

Chart 3: GDP Declines

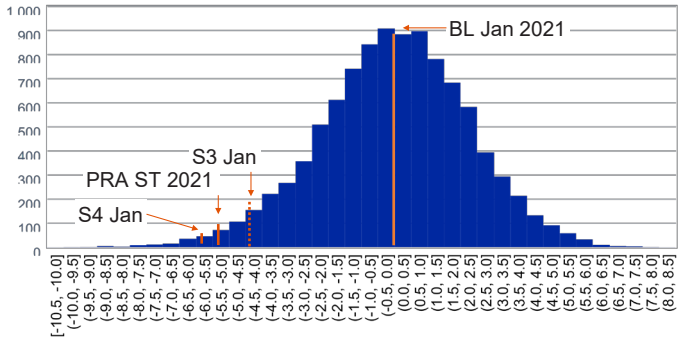
U.K. real GDP, 2020Q4=100



Sources: U.K. Office for National Statistics, Moody's Analytics

Chart 4: Scenario Severity

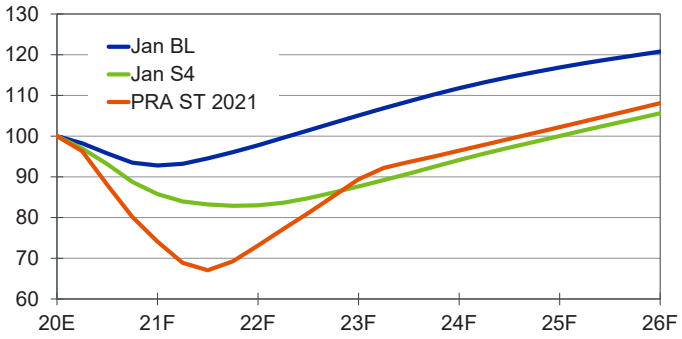
Deviations from baseline, standard deviation=2.3



Source: Moody's Analytics

Chart 5: House Prices in Doldrums

U.K. house price index, 2020Q4=100



Sources: Land Registry, U.K. Office for National Statistics, Moody's Analytics

paper investigates the effect of the payment holiday scheme on the U.K. mortgage market.

As a general practice, borrowers could be given a three-month payment holiday when they apply. However, customers who have already had a payment holiday were able to extend it for another three months, to a maximum of six months in total. The payment deferral measure was made available to most borrowers, targeting those who were facing temporary difficulties in making near-term payments due to a provisional loss of income related to COVID-19, either because of job loss or reduced income.

In this context, two main issues arise for financial institutions. First, within the payment holiday population, some borrowers in financial difficulty should be recognized as a significant increase in credit risk or credit impairment. Other borrowers were only having temporary liquidity issues, which did not increase their probability of default or attributes which are consistent with impaired credit. The second issue is related to the fact that FCA guidance made clear that using the COVID-19-related payment deferral should not automatically cause the loan to be regarded as in default or as an indicator of a significant increase in credit risk, as it does not trigger the counting of days past due. This makes it difficult for lenders to assess the mortgage market situation. Our objective is to analyze the dynamics from observed data. We quantify the impact on a representative portfolio of U.K. residential mortgages obtained from the European Data Warehouse, which reports monthly loan-level data of asset-backed securities transactions.

In order to obtain a clear picture of customers' delinquency status, a "synthetic arrears status" has been inferred from the mortgage sample. We identify loans which most likely took the payment deferral and assign them an arrears status based on the number of days for which the account balance does not decline. The payment deferral does not trigger the counting of days past due in the original portfolio, so the arrears status does not change in this case and is reported as current. The definition is illustrated in Chart 6.

Construction of the synthetic arrears status can be viewed as imposing an upper limit on potentially problematic loans. We assume that all borrowers applying for the payment deferral have financial difficulties that make them unable to pay their debt.

To run the exercise, we focus on annuity mortgages whose performance is reported monthly from January to December 2020. A full-year repayment pattern is observed for more than 125,000 mortgages. Charts 7 and 8 display the dynamics of the original portfolio compared with the synthetic arrears portfolio from March to December 2020.

Chart 9 shows the share of customers that applied for payment holidays, triggering the synthetic counting of the days overdue.

Chart 6: Synthetic Arrears Status

Current accounts

All current accounts with regular observed loan repayments.

30 DPD accounts

- DPD30 arrears bucket.
- Account status is "Current" and no observed repayments over the last mo.

60 DPD accounts

- DPD60 arrears bucket.
- Account status is "Current" or "DPD30" and no observed repayments over the last two mo.

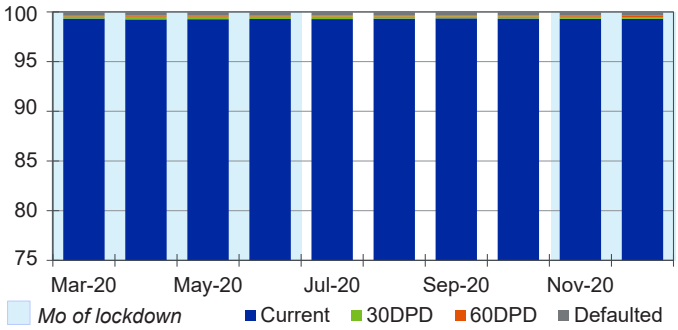
Defaulted accounts

- Defaulted account.
- No observed repayments over the last three mo.

Source: Moody's Analytics

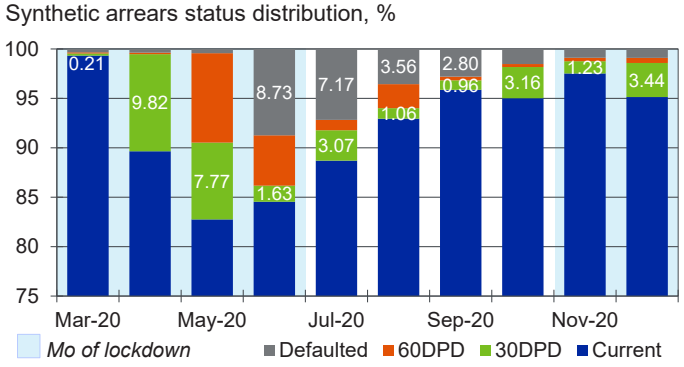
Chart 7: Original Portfolio Performance

Original arrears status distribution, %



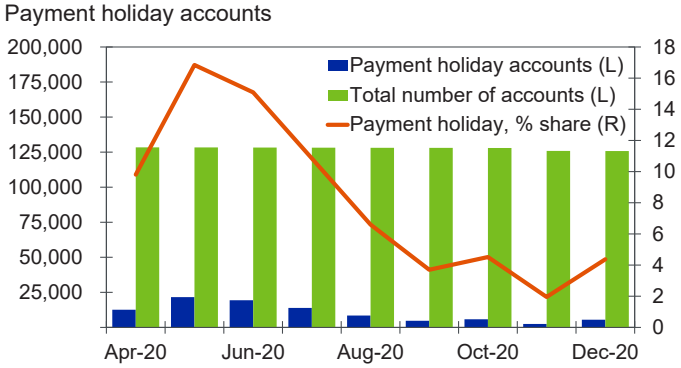
Sources: European Data Warehouse, Moody's Analytics

Chart 8: Synthetic Portfolio Performance



Sources: European Data Warehouse, Moody's Analytics

Chart 9: Payment Holidays



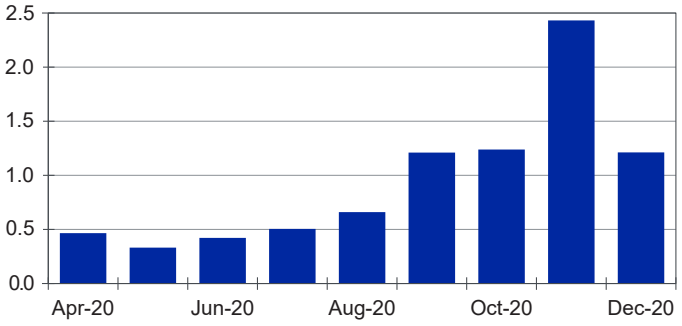
Sources: European Data Warehouse, Moody's Analytics

The two lockdowns in 2020 produced very different outcomes, as indicated by the share of payment holiday accounts. Payment holiday customers' portion peaked in May 2020 at 15%, declined over the summer because of the reactivation of the economy, and then increased again during the second lockdown. The lowest point was reached in November 2020 at 1.95%, as the scheme originally concluded in October 2020. As soon as it was relaunched, the share of payment holiday customers increased again, as observed in December 2020 at 4.37%. Chart 10 illustrates the evolution of average balance increase within the payment holiday population.

This pattern suggests that more people took advantage of the scheme as soon as it was announced. This is because of a combination of strategic payment deferrals and the actual financial distress of borrowers due to rising unemployment in the U.K. despite an extended job retention scheme.

We now focus on the most recent snapshot in the sample from December 2020. We analyze the profile of payment holiday accounts during the second lockdown, concentrating on the characteristics of loans and borrowers. We will later provide a more detailed comparison with the first lockdown.

Chart 10: Balances Rise



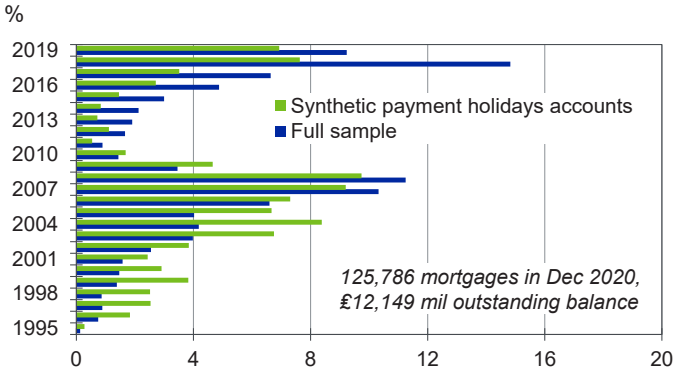
Sources: European Data Warehouse, Moody's Analytics

Our graphical analysis contrasts the distribution of various loan characteristics of the full population with the subset of payment holiday customers.

Chart 11 shows the distribution of the origination vintage. The accounts in the portfolio with synthetic arrears due to payment holidays in general originated earlier. This hints that these mortgages may be closer to maturity compared with the full sample with lower current loan-to-value ratios.

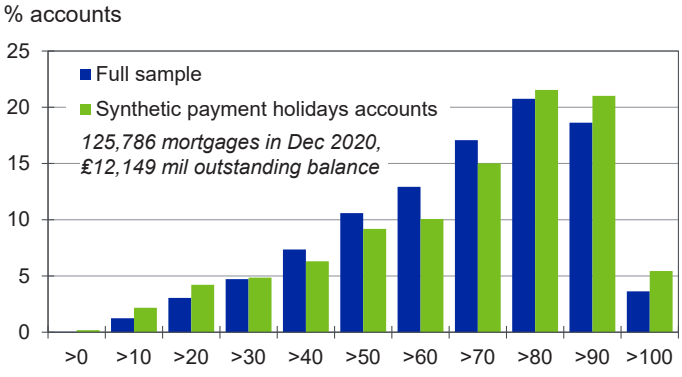
Charts 12 and 13 display the distribution of loan-to-value at origination and by geographic region. In line with expectations,

Chart 11: Vintage of Origination



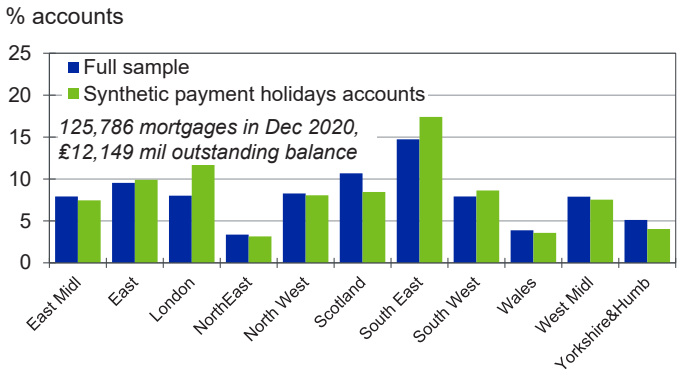
Sources: European Data Warehouse, Moody's Analytics

Chart 12: LTV at Origination



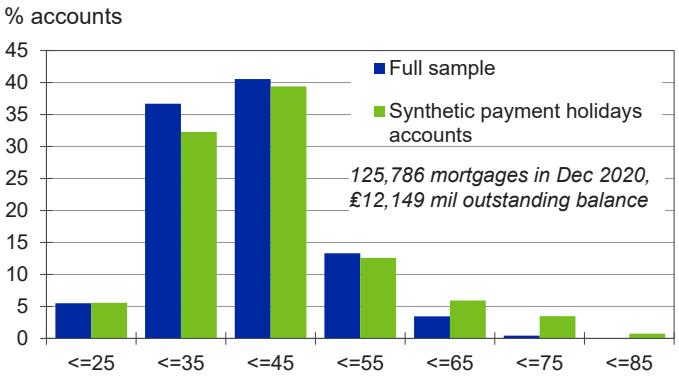
Sources: European Data Warehouse, Moody's Analytics

Chart 13: Geographic Regions



Sources: European Data Warehouse, Moody's Analytics

Chart 14: Age of Borrowers



Sources: European Data Warehouse, Moody's Analytics

accounts with payment holiday status have higher loan-to-value. Also, the London and South East regions have a greater share of accounts with payment deferral. This suggests distress in metropolitan areas of the U.K., where the hospitality industry suffered the most.

Charts 14-16 compare the overall population and the payment deferral population by borrowers' characteristics. Although the payment holidays distribution is broadly similar to the overall population, some unexpected groups such as pensioners and higher-income customers have a greater share of accounts with payment deferral. As expected, self-employed individuals have a greater share of accounts with payment holiday status.

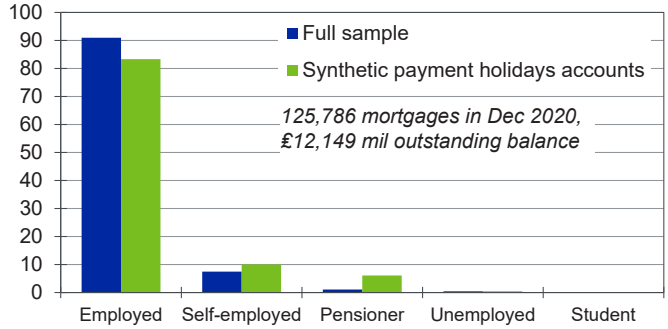
We now compare the cohorts from June and December 2020. The shift in customer profiles provides a useful insight into how the scheme was used by borrowers in the U.K. Chart 17 shows that accounts with payment holiday status had lower loan-to-value ratios in December compared with June. This indicates that the risk of default associated with accounts on payment holidays in December was lower than the risk for similar accounts in June.

Chart 18 presents the employment status distribution, where more pensioners are recorded in the December snapshot (in proportion, 6% in December, compared with 0.5% in June). We also observe a decrease in self-employed individuals (10% in December, compared with 14% in June).

Chart 19 indicates that more older borrowers applied for payment holidays in December compared with those in June 2020.

Chart 15: Employment Status

Original vs. synthetic portfolios, % accounts

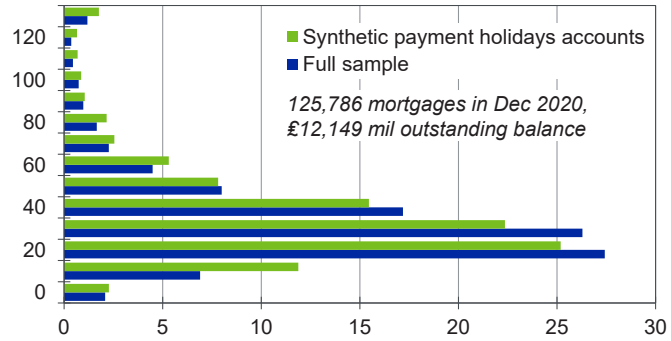


Sources: European Data Warehouse, Moody's Analytics

Finally, Chart 20 presents shares of accounts with payment holidays by region. Interestingly, this share increased in London and the South East. London recorded a 12% share in December, compared with just 7% in June. The share in the South East increased from 15% to 17% over the same period.

Chart 16: Income of Borrowers

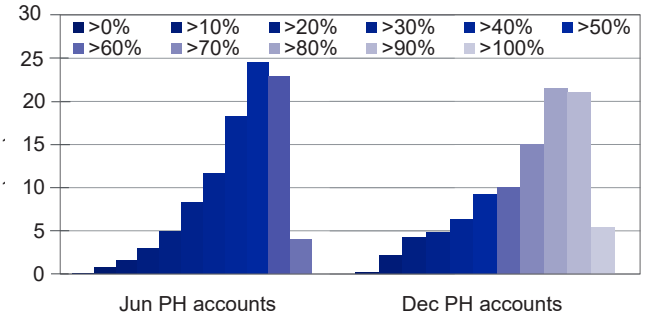
Y-axis: £ ths; X-axis: % accounts



Sources: European Data Warehouse, Moody's Analytics

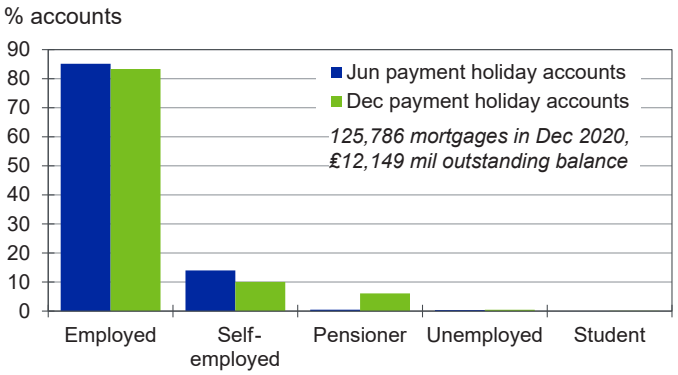
Chart 17: LTV at Origination Shifts

% accounts



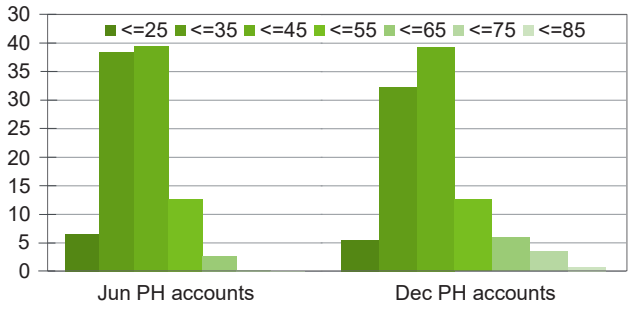
Sources: European Data Warehouse, Moody's Analytics

Chart 18: Employment Status Changes



Sources: European Data Warehouse, Moody's Analytics

Chart 19: Age Distribution Changes



Sources: European Data Warehouse, Moody's Analytics

To summarize, unusual categories accounted for a larger share in the second wave of payment holidays than in the first wave, for example, pensioners and borrowers with accounts closer to maturity. The first lockdown and the corresponding payment holidays may have been an overreaction to dramatically worsened economic conditions and the ability of borrowers to pay. However, payment holidays do not imply cancellation of the instalments and interest payments that would increase because of higher balances. This may explain why a higher share of customers already advanced in the payments with a shorter debt horizon took advantage of the scheme in December. In addition, fewer people could apply for the scheme in December because of the six-month maximum for payment deferrals. This may have resulted in a greater share of borrowers with unexpected characteristics using the scheme for strategic reasons.

Risk parameters and expected losses under the PRA and Moody's Analytics scenarios

In this section, we leverage on the stress scenarios created by the PRA and Moody's Analytics to quantify the impact on provisions and expected losses. As a starting point, we use the snapshot of portfolios with original and synthetic statuses from December 2020, described in detail above.

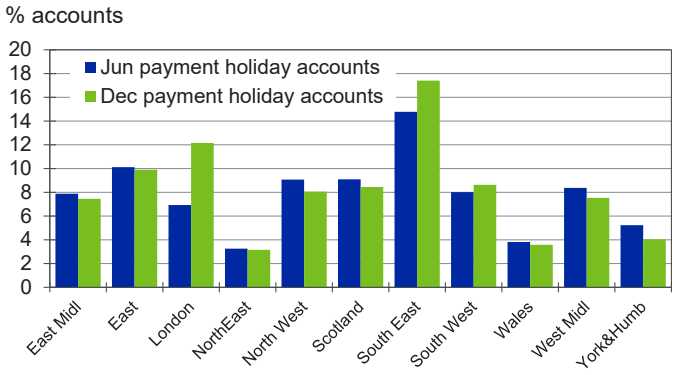
To conduct the analysis, we employ the Moody's Analytics Mortgage Portfolio Analyzer, which hosts loan-level econometric models for the probability of default, loss given default, and prepayment of U.K. residential mortgages. Chart 21 illustrates the tool's modular structure. The econometric models are integrated to produce a term-structure forecast for each of the risk metrics at loan level and loan-level cash flow across alternative scenarios. These are then summed up to produce portfolio-level cash flows and expected credit losses. The trajectories of the economic scenarios are also used to simulate corresponding default events, prepayment events, and loss given default to produce simulated losses across all loans and an estimate of the loss distribution for the portfolio.

The tool is fed with two types of data: (1) the December snapshot from the European Data Warehouse with the synthetic and reported arrears status, and (2) the economic scenarios from Moody's Analytics and PRA.

Chart 22 displays the probability of default term structure under the baseline scenario, Moody's Analytics stress scenario, and PRA stress scenario. Charts 23 and 24 complement this information and show the 12-month and lifetime cumulative weighted probability of default under the same scenarios. We make the following three sets of observations:

1. **Increasing stress on the mortgage portfolios.** Moving from the baseline scenario (which already considers the

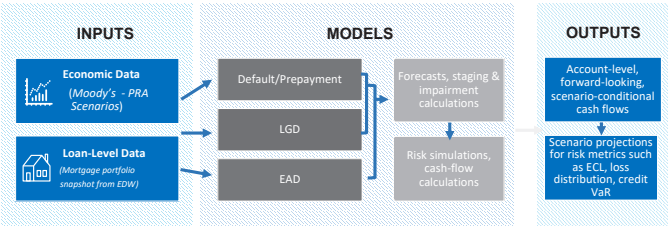
Chart 20: Changes by Regions



Sources: European Data Warehouse, Moody's Analytics

Chart 21: Moody's Analytics U.K. MPA

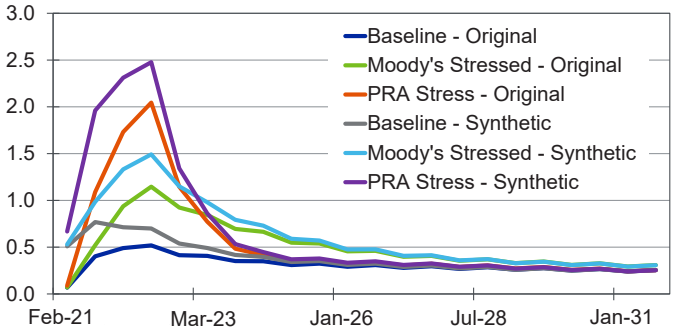
U.K. Mortgage Portfolio Analyser



Source: Moody's Analytics

Chart 22: PD Term Structure

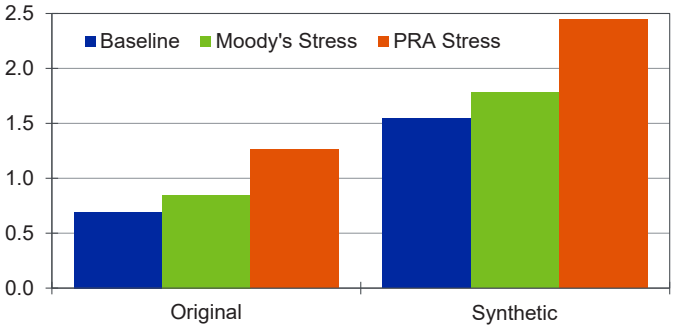
Dec snapshot, annualized conditional PD, %



Source: Moody's Analytics

Chart 23: 12-Month PD Rises Under Stress

Dec snapshot, weighted avg 12-mo PD, %



Source: Moody's Analytics

stressed outlook due to COVID-19) to the PRA scenario, the probability of default estimates are four times higher at their peak, which is reported to occur in the first quarter of 2022. The original portfolio records a peak at 0.52% under the baseline and 2.04% under the PRA stress scenario. The synthetic portfolio records a peak at 0.76% under the baseline and 2.49% under the PRA stress scenario. Sensitivity to the macro shock is proportional to the magnitude of the shock. For example, unemployment is expected to peak in the first quarter of 2022 at 11.8%, almost twice the 6.3% reported in December 2020.

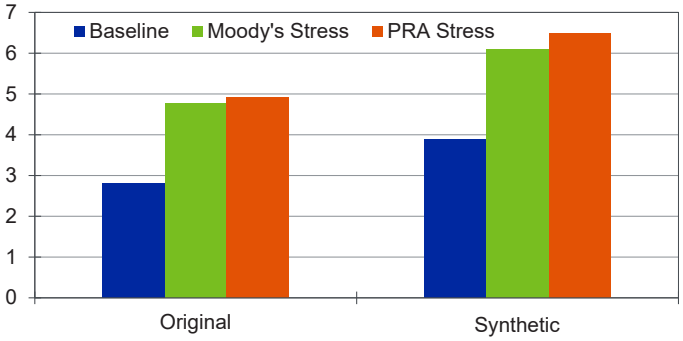
2. **Different timing of the stress across scenarios.** The PRA stress scenario is very conservative in the short term, while the Moody's Analytics stress scenario is characterized by a smaller GDP trough but a slower recovery resulting in prolonged stress. This is shown in the annualized conditional probability of default trajectories as well as in the weighted average probability of default. In the 12-month horizon, the probability of default under PRA stress conditions is consistently 1% higher in the original portfolio and the synthetic portfolio, while the lifetime probability of default is similar for both scenarios.
3. **Higher probability of default for payment holiday accounts.** When taking into account the synthetic arrears status, the 12-month and lifetime probability of default for the synthetic portfolio are higher than for the original portfolio.

Next, we calculate expected losses according to the IFRS 9 accounting rules. Stage 1 accounts represent accounts with no delinquency status and no significant increase in credit risk since origination. Stage 2 accounts have recorded a significant increase in credit risk. We further split this into non-delinquent and delinquent accounts. Stage 3 indicates accounts in default. Charts 25 and 26 compare stage allocation distribution under the baseline scenario, under the PRA stress scenario, and based on the three Moody's Analytics weighted scenarios (baseline with the weight of 40% and the upside and downside scenarios with a weight of 30% each) for the original portfolio and the synthetic portfolio.

Looking at the baseline and Moody's Analytics weighted scenarios, the impact of payment holiday accounts makes a difference in the share of stage 2 accounts. Light green represents the stage 2 accounts triggered by the quantitative staging, while orange corresponds to stage 2 accounts due to their arrears status (either synthetic or original). Under the Moody's Analytics scenario-weighted stage allocation, 18% of the mortgage book would go into stage 2 in the original portfolio, while the share increases to nearly 22% if we consider payment holidays.

Chart 24: Lifetime PD Rises Under Stress

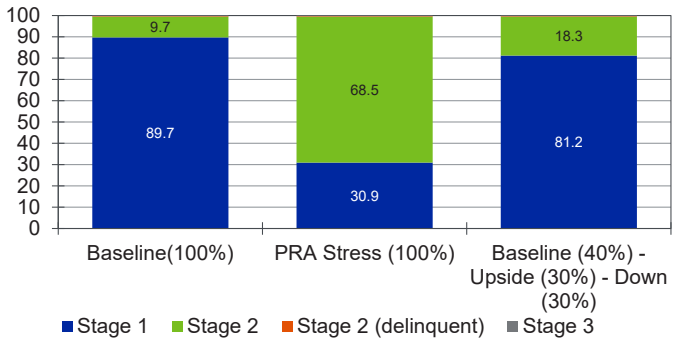
Dec snapshot, weighted avg lifetime PD, %



Source: Moody's Analytics

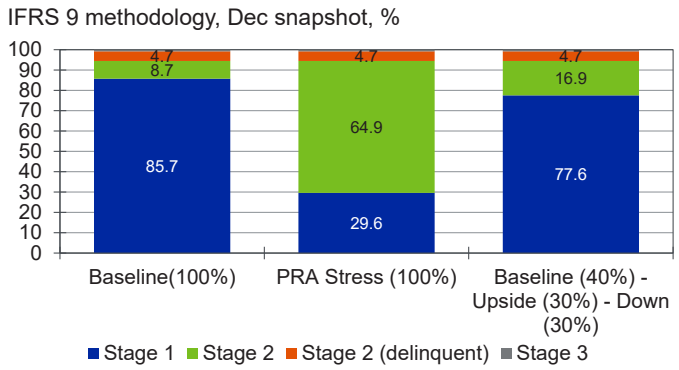
Chart 25: Staging for the Original Portfolio

IFRS 9 methodology, Dec snapshot, %



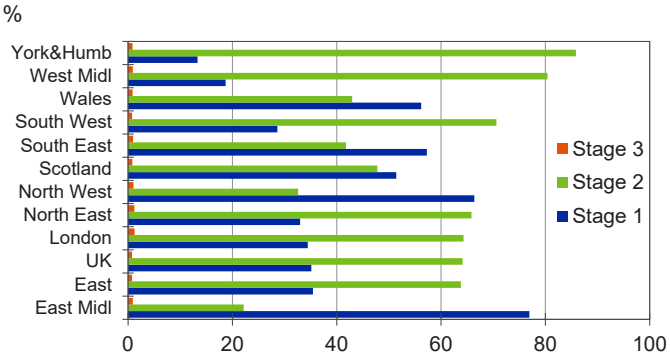
Source: Moody's Analytics

Chart 26: Staging for the Synthetic Portfolio



Source: Moody's Analytics

Chart 27: Staging by Region



Source: Moody's Analytics

A second interesting result is related to the PRA scenario. The proportion of stage 2 accounts is almost identical for the original portfolio and the synthetic portfolio, at 68.7% and 69.6%, respectively. This implies that the IFRS 9 stage allocation criteria serve as a good proxy for performance of the synthetic accounts. In other words, the IFRS 9 rules are in fact very useful in the context of the pandemic.

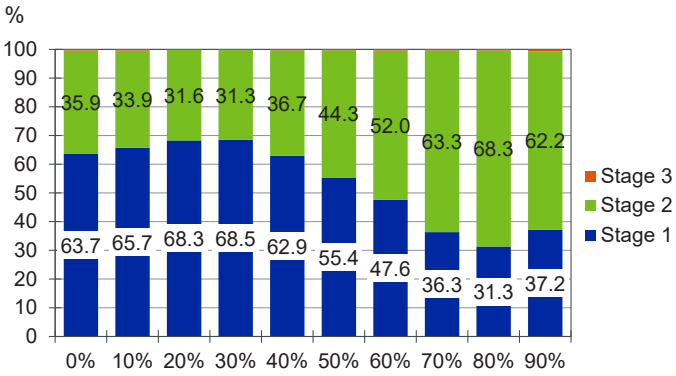
The stage allocation distribution profile gives a sense of vulnerable geographical areas. Chart 27 shows the stage stratification of the original portfolio under the PRA stress scenarios by region. Some regions have higher concentrations of stage 2 because of the intrinsic risk (85.9% for Yorkshire and the Humber and 80.4% for the West Midlands), while other regions are affected by the increased macro stress (71% for the South West and 64% for London and the East).

In terms of the loan-to-value ratio, Chart 28 shows that a significant share with higher loan-to-value ratio is going into stage 2. This is in line with the findings for the payment holiday profile and is consistent with the projected decline in house prices.

Dramatically lower house prices in the PRA stress scenario compared with the Moody's Analytics stress scenario are also reflected in the expected credit loss. The PRA scenario produces significantly higher losses for the original portfolio and the synthetic portfolio. This is a consequence of stage 2 calculations, as lifetime losses are considered as opposed to 12-month losses for stage 1 accounts. This impact is amplified for the synthetic portfolio. Charts 29 and 30 show the expected credit loss as a percentage of the outstanding balance based on the LTV profile. Compared with the baseline, the expected credit loss produced by the PRA scenario is 10 times higher across all the buckets. The effect of payment holidays produces estimates that are about 1.5 times higher across all LTV buckets.

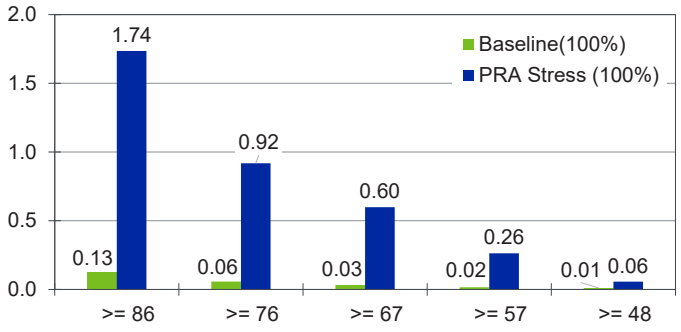
Charts 31 and 32 report expected credit loss results for the original portfolio and the synthetic

Chart 28: Staging by LTV



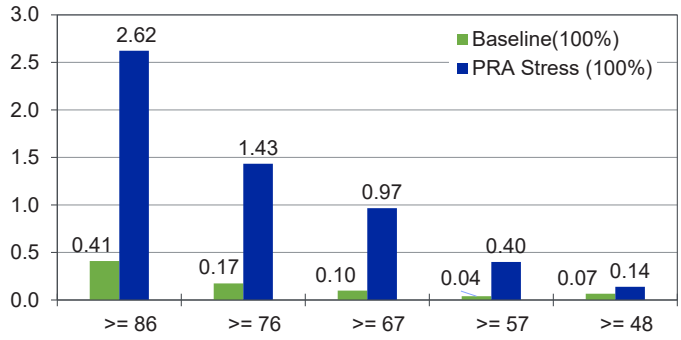
Source: Moody's Analytics

Chart 29: ECL by LTV, Original Portfolio



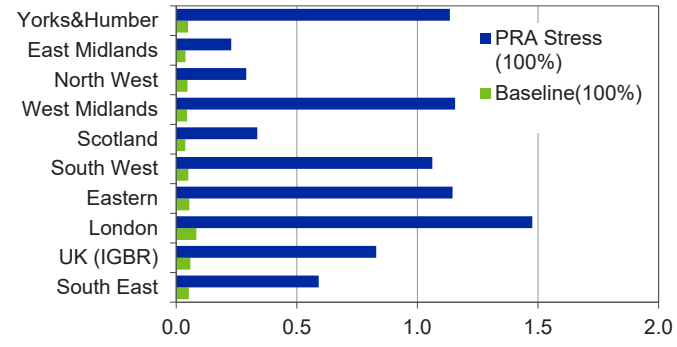
Source: Moody's Analytics

Chart 30: ECL by LTV, Synthetic Portfolio



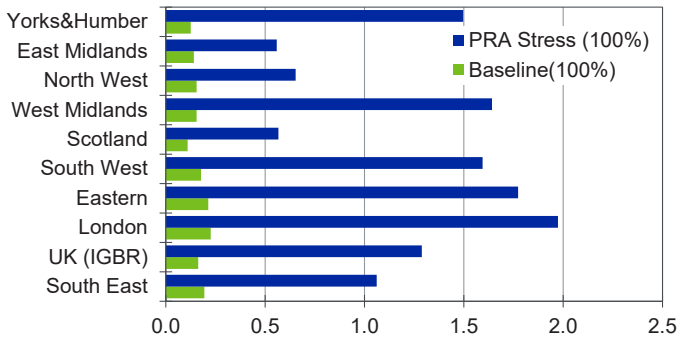
Source: Moody's Analytics

Chart 31: ECL by Region, Original Portfolio



Source: Moody's Analytics

Chart 32: ECL by Region, Synthetic Portfolio



Source: Moody's Analytics

portfolio by region. The observed patterns are similar for both portfolios, with the greatest expected losses in Yorkshire and the Humber, the West Midlands, the South West, the East region, and the London region. However, the losses are much greater for the synthetic portfolio.

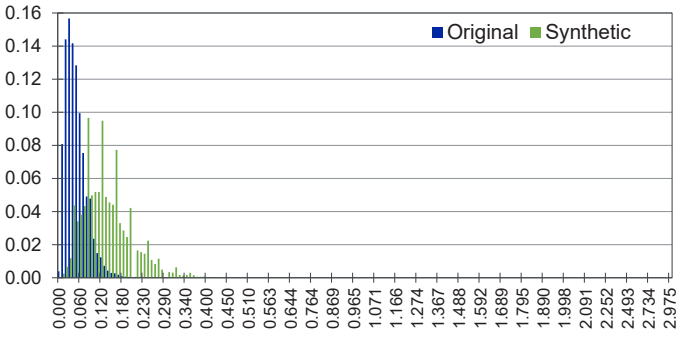
To characterize unexpected losses, we generate a distribution of losses over a 12-month horizon under the Moody's Analytics baseline and the PRA stress scenario. The distribution is based on 10,000 simulations of the performance for the original portfolio and the synthetic portfolio. Graphical representation of the distribution is provided in Charts 33 and 34, and key statistics are provided in Table 2. The distribution of unexpected losses for the synthetic portfolio is shifted to the right for the Moody's Analytics baseline and the PRA stress scenario, indicating greater losses for the synthetic portfolio. Also, the losses are much greater under the PRA stress scenario compared with the Moody's Analytics baseline scenario. Summary statistics show that the synthetic arrears status tends to triple the mean expected loss as a percentage of the outstanding balance under the baseline (4 basis points for the original portfolio versus 13 basis points for the synthetic portfolio) and nearly double in the PRA assumption (42 basis points for the original portfolio versus 78 basis points for the synthetic portfolio). For the original portfolio, the losses under the PRA stress scenario are more than 10 times greater than under the Moody's Analytics baseline scenario (0.42% versus 0.045%). For the synthetic portfolio, losses under the PRA stress scenario are around six times greater than under the Moody's Analytics baseline (0.132% versus 0.777%).

Conclusion

The COVID-19 pandemic has pummeled the U.K. economy and subsequently the U.K. mortgage market. To analyze the effect of ending payment holidays, we have constructed a synthetic portfolio under the assumption that rising or nondeclining balances imply delinquencies. The contrast between performance of this synthetic portfolio and a standard portfolio without this effect is dramatic. The attributes of borrowers taking advantage of the payment holidays is different between June and December 2020, hinting at strategic payment deferrals by borrowers with mortgages closer to maturity by the end of the year. There are additional risks associated with lifting pandemic measures. To assess the impact, we used the Moody's Analytics U.K. Mortgage Portfolio Analyzer, a tool that embeds a set of models for risk parameters linked to macroeconomic drivers. We compared the performance of the original portfolio and the synthetic portfolio under the Moody's Analytics baseline and the PRA stress scenario. The IFRS 9 expected credit loss in the original portfolio is a good proxy for accounts in stage 2 for the synthetic portfolio. The additional stress in the PRA scenario dramatically increases expected and unexpected losses, although the difference compared with the Moody's Analytics baseline scenario is less dramatic for the synthetic portfolio.

Chart 33: Loss Distribution, Baseline

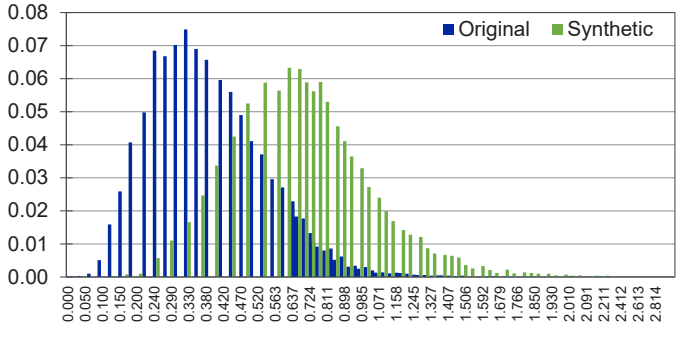
VaR approach - 12-mo expected loss, %



Source: Moody's Analytics

Chart 34: Loss Distribution, PRA Stress

VaR approach - 12-mo expected loss, %



Sources: PRA, Moody's Analytics

Table 2: Loss Distribution - Summary Statistics

	Original portfolio		Synthetic portfolio	
	Moody's baseline	**PRA stress**	**Moody's baseline**	**PRA stress**
Expected loss	0.045	0.420	0.132	0.777
Aggregate statistics				
Simulations	10,000	10,000	10,000	10,000
Mean	0.045	0.420	0.132	0.777
SD	0.030	0.201	0.067	0.298
IQR	0.037	0.235	0.085	0.366
Skewness	1.316	1.512	0.964	1.155
Kurtosis	2.634	4.248	1.482	2.488
95th/50th pct	2.574	2.089	2.080	1.816
Value-at-Risk				
50.00%	0.040	0.382	0.122	0.732
75.00%	0.060	0.514	0.169	0.931
90.00%	0.085	0.674	0.221	1.163
95.00%	0.102	0.797	0.255	1.330

Source: Moody's Analytics

About the Authors

Chiara Ventura is an assistant director at the Moody's Analytics London office. She is responsible for data-driven modelling projects that involve time series and panel data econometric techniques. She is currently the modelling lead and head of client support in the EMEA region for the Portfolio Analyzer product line. Besides developing market risk and credit risk models for stress-testing purposes, Chiara has developed models for A-IRB purposes (application and behavioural PD, LGD and EAD) and IFRS 9 (PD) credit risk models for retail and corporate portfolios. This work has included incorporating climate change factors as drivers in stress-testing models. Chiara started at Moody's Analytics as an intern in 2015 and continued her career development within the company. Chiara earned her MSc and BS in mathematical engineering from Politecnico di Milano in Italy and graduated after a collaboration with Imperial College London. She is an MPhil student at Henley Business School – University of Reading in the U.K.

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