PRUDENTIAL TREATMENT OF GREEN MORTGAGES: SUMMARY AND RECOMMENDATIONS

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1 INTRODUCTION: WHY IS THE PRUDENTIAL TREATMENT OF GREEN MORTGAGES A TOPIC?

The transition to a carbon-neutral economy entails massive investments in construction, technology and new infrastructure. The European Commission estimates that investments of around EUR 180 bn per year are required during the coming decade. This can only be realised with a strong involvement of financial institutions. Concretely, Copenhagen Economics (CE) estimates that around 50% of all the investment needed the next decade could be credit-financed (based on numbers from Denmark[1]). This corresponds to EUR 90 bn per year in Europe.

Thus, over the coming decades, a massive amount of credit is likely to flow into investments which – one way or the other – support the green transition. These loans are typically dubbed 'green assets'.

This poses the question of how these green assets should be regulated from a prudential perspective. The response to this question has often been: Exactly like any other asset – based on the financial risks: The purpose of prudential regulation is to guard against expected credit losses and unforeseen events – no matter the colour of the asset.

We agree with this. It would be inappropriate if prudential regulation starts to become a delivery mechanism for other policy purposes, i.e. politically incentivising green investments. We have other more economically sound methods for this, e.g. taxes on CO2 emission, quotas, etc.

Nevertheless, it is important that we treat green assets correctly, incorporating any risk mitigating factors that green assets entail, thus *not disincentivising* green investments.

This pushes the question one step ahead: *From a risk perspective, are there special characteristics of green assets that are important to take into consideration, which the current regulatory and supervisory system is not geared towards?*

Within the Energy Efficient Mortgages Initiative (EEMI), Copenhagen Economics has been tasked to analyse this question in relation to energy efficient mortgages (EEM), i.e. mortgage credit to energy efficient building and energy renovations. Our hope is that these results and recommendations will not only guide the debate on green mortgages but can provide general guidance on the prudential regulation of green assets.

2 RISK MITIGATION OF ENERGY EFFICIENCY

We have analysed whether EEMs entail any risk mitigating factors from two perspectives:

[1] See Copenhagen Economics (2020) *Finanssektorens klimapartnerskab*, p. 54

1. Current perspective: examining the current stock of EEMs
2. Forward-looking perspective: examining the performance of EEMs in a transition risk scenario, with increasing costs of emitting CO2

2.1 Current perspective

A range of different studies confirm that energy renovations increase the collateral value of a house.[2] This is unsurprising as an energy renovation decreases the monthly cost of heating, thereby decreasing the costs of living in the building.[3] Theoretically, the house price should increase by the value of all future discounted energy savings. However, empirically, we find that housing prices historically only have increased by around 60% of the theoretical value.

In our research, we have found that financial institutions often do not incorporate this value increase in the regulatory capital system when lending to energy renovations. This means that EEMs could currently have too high capital costs, compared to what is justified from a risk perspective. Note that this is only a problem when the building is renovated; for house purchases, the market value of the house is automatically included in the regulatory capital system.

The impact is, of course, very case-dependent, e.g. it depends on the country of residence, the current value of the building (depending on, for instance, its location) as well as the size and effectiveness of the renovation. In a case based on average EU values, we find that risk weights (i.e. capital charge for the asset) would typically decline by some 2-3 percentage points[4], when including the value increase from the energy renovation (depending on whether we rely on the theoretical or empirical value increase).[5]

As mentioned, the impact is very case-dependent, and different circumstances could push the impact of the green risk mitigating factor up, including:

- If the household is restricted by the loan-to-value (LTV) limit and would have to finance the renovation with an unsecured loan, this could lead to a green risk mitigating factor in risk weights of around 4 percentage points.
- Based on empirical research, we have conservatively assumed that only around 60% of the renovation costs are priced in. With the current low interest rate environment and stronger awareness of climate change, a larger share could be priced in today. Further research in this field could thus lead to higher effects.[6] If

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[2] We have also analysed the impact of a lower energy bill due to an energy renovation. However, a lower energy bill will only provide small improvements in the loan-to-income ratio (typically, the energy bill takes up around 2-4% of the household's gross income), which in the prudential framework is decisive for the PD. Concretely, based on a study by ECB, we find that the PD would decline with around 0.02 percentage points due to the lower energy bill in our case.

[3] Evidence from CRIF Real Estate's *Building Energy Efficiency Simulator* in Italy suggests that an energy renovation of around EUR 20,000 – 30,000 could reduce energy costs by between 50-70%. A similar dataset of simulations of the impact of energy renovations on energy costs is also being established in other countries, for instance Spain.

[4] Compared to a risk weight of around 17%, implied by the median PD and LGD of the largest European banks.

[5] Note that an entirely credit-financed energy renovation will – everything else being equal – increase risk weights due to the higher leverage of the customer. The point is that including the value increase of the collateral will *mitigate* this increase in risk weights.

[6] An analysis based on Dutch data presented at the third virtual Bauhaus event in February 2021, for instance, finds that around 80% of the discounted energy savings are reflected in property prices.

the full value of renovations was included, the risk mitigating factor could be a decrease in risk weights of up to 3 percentage points.

Finally, the Energy efficiency Data Protocol and Portal (EeDaPP) project (along with other recent studies) finds a significant correlation between energy efficiency and lower probability of default.[7] If the correlation found in the EeDaPP analysis was included, we find that the lower probability of default could enhance the risk mitigation effect by between 20%-40%, depending on the degree to which collateral values are updated upon renovation.

Summing up, energy renovations do indeed have implications for the risk of mortgages and therefore also for capital charges. The effects identified would probably not fundamentally change the incentives to conduct energy renovations but do push in the direction of lower funding costs for green investments.

Importantly, in this study, we have only examined private market effects. In addition, government subsidies, tax rebates and other public incentivising could not only directly incentivise green renovations but also enhance the risk mitigating factor described above. For example, if part of the upfront costs were financed with a subsidy, the leverage will increase less, leading to a larger risk mitigating effect from an energy renovation.

Implication for standardised approach

Our focus in this estimation is the impact of risk mitigating factors for banks using internal models. However, the impact will not be one-to-one for banks using the standardised approach to credit risk. Risk weights are prescribed by the regulatory framework according to certain *loan-to-value (LTV) bands* which are less risk-sensitive than banks' internal models. An increase in the collateral value due to an energy renovation will, in many cases, not be enough to move a loan down to a different LTV band, thereby preventing that risk mitigating factors can be appropriately considered on the customer level. In addition to that, standardised risk weights are not sensitive to changes in the risk of mortgage default. Therefore, the lower probability of default (PD) that has been observed for energy efficient buildings in different studies cannot be taken into account in the current framework for banks using the standardised approach.

[7] See EeDaPP (2020) *Final report on correlation analysis between energy efficiency and risk*. A (forthcoming) study by the Nationwide Building Society confirms their results, based on mortgage data from the UK. A study prepared by authors from the Bank of England similarly finds that mortgages against energy efficient properties are less frequently in payment arrears (see Guin & Korhonen (2020) *Does energy efficiency predict mortgage performance?*)

Box 1: Main takeaways from Section 2.1

- Energy renovations entail risk mitigating factors, which typically lead to a reduction in risk assessment within the prudential framework, i.e. lower capital charges.
- We find that this risk mitigation is often not appropriately captured by the prudential framework of individual institutions.
- The risk mitigation is very case-specific. For a typical EU household, we find that a typical energy renovation could reduce risk weights with some 2-3 percentage points.

2.2 Forward-looking perspective

Most countries in the EU are still at the beginning of the transition to a low-carbon economy. This entails that most of the potential risk mitigation from energy efficiency has yet to materialise.

A cornerstone in the green transition is that the costs of emitting CO2 need to increase to incentivise green investments. Therefore, to fully understand the risk properties of EEMs, we can evaluate their performance in a scenario with increasing costs of emitting CO2. This is often referred to as a transition risk scenario.[8] This is in line with the approach taken by the recent study by the Bank for International Settlements (BIS), stating that: "Given its forward-looking nature, analysis of transition risks is focused on scenario analysis"[9]

The methodology behind our scenario analysis is explained in more detailed in our forthcoming '*Transition risk scenario analysis blueprint*'.

The dynamics of the scenario analysis can be summarised as follows: for energy *in*efficient buildings, the higher CO2 price increases the cost of heating, which increases the livings costs of that building, thus reducing the housing price, i.e. the collateral of the mortgage. This increases risk weights for that given mortgage. For EEMs, the cost of heating does not increase as much, thus leading to better relative performance.

In our simulations, we find that the above-described transition risks – on average – seem manageable. In a case resembling average EU values, we find that risk weights for an energy label D building increase by 1.1 percentage points compared to the same baseline risk weight of 17% as in the current perspective. Risk weights for lending to a building with energy label B increases by some 0.6 percentage points, thus outperforming the average building by some 0.5 percentage points.

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[8] Due to their forward-looking nature, transition risks are typically analysed using scenario analysis, see also BCBS (2021) *Climate-related risk drivers and their transmission channels*

[9] See Basel Committee analytical reports on climate-related financial risks (2021): https://www.bis.org/press/p210414.htm

This estimated average impact includes a large heterogeneity among customers. For example, for an energy label G building with an oil boiler as a heating source, risk weights will increase by 4.5 percentage points.

Also, the above analysis is based on a CO2 price scenario by the Network for Greening the Financial System (NGFS)[10], i.e. assuming a one-size-fits-all scenario for all EU countries. However, many countries already today have an implicit CO2 price on heating, meaning that a realistic (and needed) CO2 price scenario will diverge significantly between countries.

All in all, this points towards that transition risks on average are manageable but that they are also very portfolio-specific, requiring a portfolio-specific analysis.

Box 2: Main takeaways from Section 2.2

- The green transition will increase the risk mitigating potential of energy renovations.
- Transition risks seem to be manageable on average, but risks are very portfolio-specific, requiring portfolio-specific analysis.

3 REGULATORY IMPLICATIONS

Our research shows that EEMs do have certain risk mitigating aspects that currently are not included in the prudential framework, both from a current- and forward-looking perspective. Our research also shows that – on average – these effects are not major, with a magnitude of a 2-3 percentage point reduction in risk weights. But it also shows that these effects are at least portfolio – and often – customer-specific.

Thus, we do see that it provides a scope for updating the regulatory framework to include these aspects, but no overhaul.

3.1 Current perspective

For the collateral effect, we see this primarily as a challenge on the supervisory and institutional level. The current EU regulation (CRR/CRDIV) allows for the collateral to be updated based on a renovation. This practice is also accepted by most member states (although important exceptions exist, e.g. France). In fact, when conducting an energy renovation, some banks already today have procedures where a higher collateral value is

[10] The NGFS, established in December 2017, is a group of more than 80 central banks and financial supervisors that has the goal to strengthen the global response required to meet the goals of the Paris agreement. In their *orderly transition scenario*, the CO2 tax is introduced immediately and is assumed to increase by USD 10 per tonne of CO2 emitted to keep global warming well below 2°C. This is the main scenario we analyse in our report and corresponds to a smooth transition path.

included. And the final Basel III agreement allows for the updating of the collateral value of buildings based on renovations.

This is in line with recent research by BIS, confirming that: "Taken together, the reports conclude that climate risk drivers can be captured in traditional financial risk categories".[11]

Thus, the barriers for the current perspective are primarily of a technical nature: Designing systems that allow the collateral value to be updated and have these systems approved by local supervisors. Sufficient data is not always available, or it's costly to acquire, and a physical visit is often required by supervisors to approve the value increase of the renovation. The process to update the EPC label is often cumbersome.

However, once correct systems to include the increase in collateral value are in place, the regulatory system is geared towards including these risk mitigating factors. A higher collateral value will, in most cases, lead to lower risk weights associated with EEMs.

To include the impact on PD, we are yet to find the root cause to be able to determine how to include it. Thus, further research is needed to identify the channel through which energy renovations lead to a lower PD.

Implication for standardised approach
For IRB-approved banks, higher collateral will directly impact the capital costs for each EEMs in the banking book. In theory, the same applies for banks working under the standardised approach, as the different buckets for risk weights are based on the LTV ratio (and the LTV ratio will decrease once the increase in collateral is sufficiently updated). For some loans, this decrease will be enough to move them to a lower LTV band and therefore a lower risk weight bucket. The overall impact on risk weights could thus be similar to the one for IRB banks.

However, such a discretionary change does not take into account the risk mitigation from the impact on the collateral on a customer level. Therefore, if the impact on collateral should be fully included on a customer level, it would have to be done so through more ad hoc calibrations, to reflect the risk mitigating impact of energy renovations.

Furthermore, the standardised approach does not consider a lower risk of default of energy efficient properties – a correlation which has been documented in various studies. As described above, the impact on the PD could correspond to a reduction in risk weights of 5 percentage points for label A buildings.

Impact of the Final Basel III framework
The above conclusion, that the current framework should be able to capture the green risk mitigating factors on collateral, could be affected by the upcoming implementation of the Final Basel III agreement.

[11] See Basel Committee analytical reports on climate-related financial risks (2021): https://www.bis.org/press/p210414.htm

The agreement includes output floors that – in the form proposed by the EBA – will make capital requirements unresponsive to changes in the underlying collateral for around half of Europe's large banks. For these banks, EEMs will hardly experience lower capital costs.

In other words: green risk mitigating factors are not key drivers of risks. We are talking about small changes. To capture green risk mitigating factors, capital requirements will therefore have to be quite risk-sensitive. This is exactly what we argue for above.

On the other hand, a proposal like the Final Basel III that reduces risk sensitivity, will make the prudential framework less responsive to improvements in collateral value and therefore also less responsive to green risk mitigating factors.

Box 3: Main takeaways from Section 3.1

- Once technical and data-related barriers are resolved, the current regulatory framework should be able to capture risk mitigating effects of energy renovations.
- Safeguarding the risk sensitivity of the regulatory framework is a prerequisite to appropriately reflect the risk mitigating factors of EEMs.

3.2 Forward-looking perspective

The forward-looking perspective is meant to capture the fact that EEMs are less prone to the risk of decreasing collateral values when the costs of CO2 emissions increase.

There is, to our knowledge, no clear guideline on how to include such forward-looking risks, although the risks bear similarities to the stress test buffer included in Pillar 2, making it a natural approach.

Exactly how to include it in Pillar 2 is, however, an open question. Ideally, it could be included in connection with a general rethinking of the Pillar 2 system to calibrate the general desired capitalisation – perhaps in combination with the upcoming Final Basel III framework.

The solutions sketched out above requires development and take time. Technical solutions to estimate increase in collateral from energy renovations needs to be developed and approved by regulators. Furthermore, credit institutions need to develop a transition risk scenario framework, based on a country-specific CO2 price scenario.

This leaves the question of what to do in the meantime until these solutions have been developed. It could be argued that the urgency of the climate agenda requires that

incentives are immediately aligned with the underlying risks for EEMs. This is fundamentally a political decision.

Box 4: Main takeaways from Section 3.2

- How exactly to incorporate the impact of transition risks in the current regulatory framework remains an open question and requires further research.
- The urgency of the climate agenda might require that incentives be immediately aligned with the underlying risks for EEMs.