Green Swans: Green Homes and Green Mortgages Address Key Pillars of Banking

- Energy Efficiency and Real Estate Finance
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    I. Client Acquisition
    II. Governance
    III. Enterprise Strategy and Planning
    IV. Risk Management
    V. Financial Reporting and Disclosure Practices

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Energy Efficiency and Real Estate Finance

- **Energy efficiency measures** naturally complement viability real estate finance product offerings for originators, issuers, underwriters, investors and borrowers while offering favorable economics.

- Energy efficiency and climate-risk mitigation factors contribute to **innovation in financial products** and inform management decision-making in ways that have profound impacts on franchise value which far outweigh short-term costs and efforts of adoption, implementation and execution of green home and green mortgage programs.

I. Client Acquisition

- **Energy Efficiency Savings:** from the ownership of a green home can be attributable to multitudes of factors and readily translate into income for underwriting purposes and have benefits for borrowers and lenders.

- **Certification:** demonstrates the reliability of the energy savings which has an overwhelmingly positive differential can be counter-cyclical as energy consumption decreases during recessions.

- **Innovation:** of green mortgage product offerings which exhibit greater demand and differentiation in the marketplace over a standard mortgage while providing the bank with a more profitable product offering with sound risk attributes.

- **Marketplace differentiation:**
  - **Consumer level:** enhances franchise value in local markets
  - **Institutional level:** Ability to gain recognition in the capital markets with landmark deals, expanded deal-type offerings, access to targeted base of ESG investors and broader pools of liquidity.

II: Enterprise Strategy and Planning

- Informed management decision-making through greater understanding of specific borrowers, credit tiers and entire market segments
- Greater manageability, sophistication and risk differentiation during internal economic capital adequacy planning. Robust economic capital model design and execution for critical internal analytics and required regulatory reporting will drive many primary and secondary benefits

Strategy and Planning
Capital Planning: optimal mix of borrowers, counterparties and informed decisions about on and balance sheet exposures including securitization structures, hedges and guarantors.
Asset Quality; optimal mix borrowers
Profitability: improved product pricing on the front line with consumers and in capital markets
Liquidity and Funding Profile; Asset-Liability Management: appropriate mix of instruments in liquidity portfolio and diversified funding mix

III: Risk Management: Credit: Banking Book + Trading Book

Regulators

- Tell us this about single family residential mortgage credit risk:

$$V = \sqrt{\rho} * Y + \sqrt{1 - \rho * \varepsilon}$$

- Which is not entirely correct because we live in a far more complicated world
- The Bank of England reports that **observed default rates on energy efficient mortgages is lower**
- Which is **correct** because we know with everything equal energy savings are reliable which combined with the additional attributes of a green single family residential mortgage credit risk lower risk across many key risk dimensions besides just one risk factor.

III: Risk Management: Credit: Banking Book + Trading Book

Loan level

- Address the idiosyncratic risk of mortgage portfolios disaggregated into borrower specific factors and property specific factors across a variety of borrower credit tiers, property types and deal structures.
- **Single Family** Detached Homes: Mortgages, MBS (Agency, Private Label, NPLs, RPLs), Covered Bonds, ABS (MBS Covered Bonds), Pfandbrief and Sukuks (Asset-Backed)
    - Probability of Default: decreases from higher income, energy savings and credit profile
    - Loss Given Default: higher property value attributable to higher quality building materials and market preference for green favorably impacts
- **Multi-Family:** Apartments, Condos, Coops
    - Stronger Net Operating Income (NOI), Debt Service Coverage Ratios (DSCRs), Loan-to-Value Ratios (LTV) which favorably impact the probability of default and loss given default

Portfolio level

- Counterparty Credit Risk
- Hedging Costs
- Correlation Impact
- Capital Allocation

III: Risk Management: Credit: Banking Book + Trading Book

Property Value and Default Risk

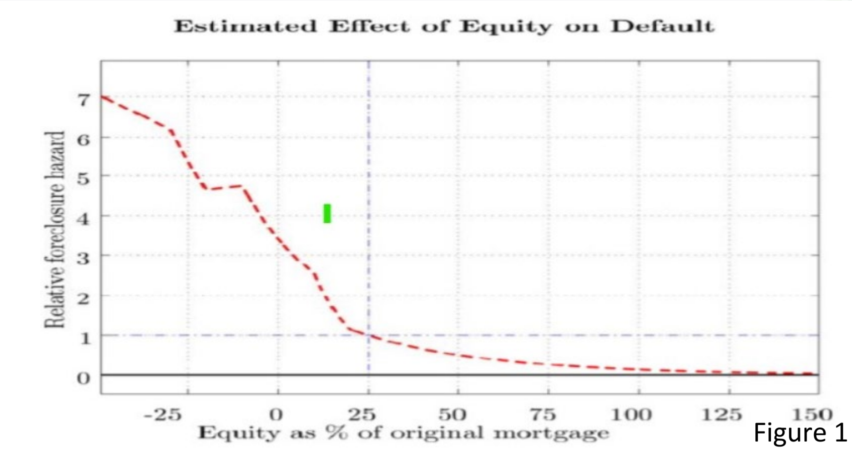

Figure 1

- The relationship between default risk and property value and LTV depicted in Figure 1.

- Demonstrates the impact of property value and LTV on default risk showing how increased property value leads to lower default risk

- Asymptotic shape makes the obvious point there's always some default risk given there's principle outstanding.

- The upper end of the credit tier depicted against the lower end

- With all else being equal high quality credits withstand market shocks and macroeconomic dislocations much better (Figure 2)

- The implication for default timing is clear but more subtle points are within transitions among different states of default (30+, 60+, 90+).

- Higher quality credits stand better chance of reperforming or sustained reperformance through modifications or restructurings.

Default Timing Curves Across Credit Tiers

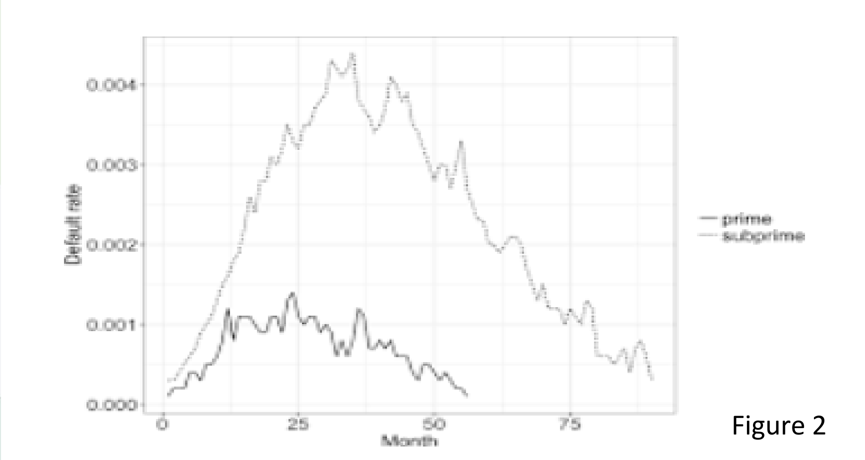

Figure 2

III: Risk Management: Market: Portfolio + Counterparty

MBS, Covered Bonds, Pfanbriefs, Sukuks
Increased transparency from property level certification allows for dynamic adjustment to deal-specific risks or property-sector, product-sector or exposure to macroeconomic and systemic risks.
VaR: lower borrower and counterparty default risk which decreases deal specific market risk and VaR (S-VaR, E-VaR, C-VaR) profile
CPR: Lower prepayment speeds based on borrowers and lenders who make more informed decisions
Fx: lower currency risk from a broader array of swap counterparties

Mortgage Insurance
Lower risk and lower LTVs should lead to lower mortgage insurance premiums which would reduce default risk at a loan level and reduce counterparty default risk at a deal and portfolio level.

III: Risk Management: Interest Rate: Banking Book + Trading Book

Loan Level
Great flexibility and manageability

Portfolio Level
Improved Capital Allocation
Lower Hedging Costs

III: Risk Management: Liquidity, Funding

Liquidity Risk

- Increased investor base through ESG markets and targeted, product-specific markets reduce volatility and improve price

III: Risk Management: Operational

Operational Risk

- Informed underwriting will lead to more data less prone to error more adequate for management reporting and regulatory reporting.

III: Risk Management: Green Weighting Factor

- Credit Risk: Banking + Trading Book
- Market Risk: Portfolio + Counterparty
- Interest Rate Risk: Banking + Trading Book
- Liquidity + Funding Risk
- Operational Risk

The industry is waiting. We can take some fairly simple measures during these times or others can move ahead and take market share. Some of the measures may have medium-term or longer-term benefits but what is good for the environment is good for borrowers (first-time buyers, homeowners, real estate investors) as well as mortgage originators, underwriters, issuers and the variety of real estate capital market investors.

IV: Financial Reporting and Disclosure Practices

- **Accounting:** IFRS, GAAP
- **Regulatory:** BIS, ECB, Local Regulators
- **Environmental:** facilitate disclosure of **Sustainable Finance Disclosure Regulation (SFDR)** and **Non-Financial Reporting Directive (NFRD)** which indicate alignment with the **EU Taxonomy**.

. Governance

- **Forthcoming proposed framework:** which dynamically incorporates integration of environmental risk mitigation attributes of Green Home and Green Mortgage Programs and product offerings into sound risk management practices and they pertain to comprehensive array of governance guidance and policies for addressing environmental and climate-related risk.

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Thank You