**🎤 Three Related Financial Formulas That Changed the World… and How We Could Update Them for Climate Change**

**🔹 0. Why This Matters — Especially If You Don’t Like Banks**

“Let me start with a provocation: If you care about climate change, you should care about how banks work.”

**💬 Why?**

Because **banks decide where capital goes.**  
And **where capital goes determines what gets built**.

“Every solar panel, every wind turbine, every gas pipeline — someone had to finance it. Or decide *not* to.”

Banks and investors may not *talk* about emissions. But their lending decisions either **lock in carbon** or **enable the transition**.

**🏦 Why does this system deserve our attention?**

You may not love banks. That’s fair.

But here’s the reality:

* Banks **allocate trillions**, often based on internal risk models.
* These models influence **who gets funding**, at what cost, and for how long.
* The system **runs silently** in the background — but it’s one of the most powerful forces shaping our carbon future.

“Climate policy can struggle to pass parliaments. But bank capital rules change every few years — and they affect *everything* from mortgages to oil exploration.”

**⚠️ The problem:**

Today, most financial models:

* Assume the past predicts the future,
* Treat climate risk as a footnote, and
* Give **cheap credit to high-emissions sectors**.

Not (necessarily) because of bad intent — but because the models don’t see the risk. And regulators haven’t told them to. And perhaps because regulators have tied both their hands behind their backs.

“If you’re trying to fight climate change without understanding this machinery, you’re bringing a spoon to a sword fight.”

**📣 What this talk is about:**

“This talk isn’t about defending finance. It’s about understanding it — so we can **reshape it**.”

I’ll walk you through:

* The credit risk models that control how banks see the world,
* How they ignore climate,
* And how — with a few adjustments — they could become one of the **most powerful levers** for a just transition.

**🔹 1. Hook: The Formulas That Transformed Credit Risk**

“In 1905, Einstein gave us E = mc². In 1997, JPMorgan gave us these.”

**🧠 The Three Formulas**

**1. Merton (1974)**

formula PDi = 1 - F (Zi)

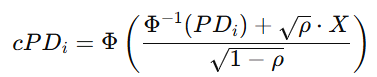
*A firm defaults when its assets fall below a threshold Z.*

**2. Vasicek (1987)**

formula 

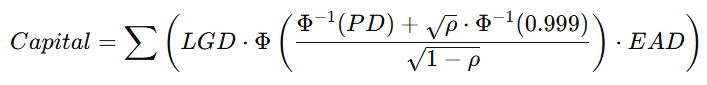
*Z is driven by a systematic factor XXX and an idiosyncratic factor ϵi*

**3. CreditMetrics™ (1997)**



*This expresses how a firm’s PD changes under systemic stress conditions.*

**📊 Basel Capital Formula (Portfolio Level)**



“This is the formula that still defines how much capital banks must hold—and thus, how much they can lend.”

**🔹 2. CreditMetrics™: An Unlikely Gift to the World**

In 1997, JPMorgan and partners released **CreditMetrics™** as a freely available technical document. It wasn’t a sales brochure; it was a blueprint for a **new global standard in credit risk**.

**💡 Why give it away?**

* **Thought leadership**:  
  JPMorgan solidified its position as the market’s most sophisticated risk modeler.
* **Influence over regulators**:  
  CreditMetrics™ was widely adopted and helped shape Basel II’s Internal Ratings-Based (IRB) approach.
* **Interoperability**:  
  Banks needed standardization to grow credit derivatives markets—shared models reduced valuation disputes.
* **Network effects**:  
  Like any standard (think TCP/IP or Unicode), the value increased as adoption spread.

*“It wasn’t altruism—it was strategic openness. The result, however, was a public good.”*

**❓Why Can’t We Do This Now?**

“Paradoxically, a more regulated world has made open collaboration less likely.”

**🔒 1. Regulatory Liability**

* Modern capital models must be:
  + Validated
  + Supervisory-approved
  + Legally defensible  
    → Banks won’t adopt IP they don’t fully control.

**💼 2. ESG as IP**

* ESG/climate risk models are now monetized by vendors (MSCI, Moody’s, BlackRock).
* Firms prefer **commercial secrecy** to standardization.

**⚖️ 3. Arms-Length Supervision**

* Post-2008, regulation became adversarial, not collaborative.
* Publishing assumptions = potential future liability.

“We’ve moved from ‘publish and shape the future’ to ‘comply and protect the IP.’ That’s why CreditMetrics™ was a one-off.”

**🔹 3. Why Climate Belongs in the Credit Risk Model**

“Climate change is a systemic risk. Our credit risk formulas were designed to model systemic risk. So why hasn’t climate entered the equation?”

**🔧 How Climate Affects PD and ρ:**

* **PD ↑**:
  + Transition risk: policy shifts, stranded assets
  + Physical risk: floods, drought, heat, disease
* **ρ ↑**:
  + Climate shocks affect entire regions/sectors → higher correlation across firms

“Higher PD and ρ = higher capital = less lending to high-risk sectors. The regulatory mechanism is already in place—we just haven’t turned it on for climate.”

**🔹 3A. Climate Stress Testing: What It Tells Us, and What It Doesn’t**

**Stress testing** is now used by regulators worldwide:

* ECB 2022 Climate Stress Test
* BoE CBES
* NGFS climate scenario toolkit

**✅ What stress testing does well:**

* Raises internal awareness and board engagement
* Identifies vulnerable exposures (e.g. fossil fuels, agri, property)
* Projects long-term losses under disorderly transition or physical risk scenarios

“The ECB found some banks could lose 30–50% of value in key climate-exposed portfolios.”

**❗But Here’s the Limitation:**

**Stress tests diagnose—but they don’t prescribe.**

* Results are not probability-weighted
* Supervisory responses are often qualitative (e.g., governance review, soft Pillar 2 guidance)
* Outputs are not standardized enough to inform pricing, capital allocation, or loan structuring

“We run the fire drill. Then we leave the sprinklers off.”

**🔹 4. Why Stress Testing Can’t Price Risk**

“Stress tests ask ‘what if?’ Pricing asks ‘what now?’ The two don’t speak the same language.”

**🧮 Why Stress Testing Fails as a Pricing Tool:**

* **No statistical base**  
  → Scenarios are not expected outcomes; they’re narratives.
* **Volatile assumptions**  
  → Every new stress test introduces new results—pricing can’t keep up.
* **No comparability**  
  → Different assumptions → inconsistent outputs across institutions.
* **Pricing needs stability**  
  → You can’t reprice every loan every time the NGFS tweaks carbon pricing.

“You wouldn’t quote a mortgage based on tomorrow’s earthquake simulation. Likewise, stress tests can’t price credit.”

**🔹 5. Capital: The Subtle Climate Policy Tool We’re Ignoring**

“If divestment is a sledgehammer, capital is a scalpel.”

**Why Capital Incentives Work:**

* **They preserve optionality**: Banks can still lend, but must justify risk.
* **They align risk with cost**: Higher risk → higher capital → higher spread.
* **They create market-based incentives** to reallocate—not just withdraw—credit.

**📊 Example:**

* High-carbon firm → PD↑, ρ↑ → capital↑ → lending↓
* Green firm → lower PD (policy tailwinds), ρ↓ (diversification benefit) → cheaper capital

“No need to ban brown. Just make it pay its way.”

**🔹 6. What Would a ClimateMetrics™ Look Like?**

“We don’t need new regulations. We need new inputs to the formulas we already use.”

**ClimateMetrics™ Would Include:**

* Climate-adjusted PDs and correlations
* Built from NGFS and CMIP6 scenario pathways
* Sector- and region-specific calibration
* Open-source governance
* Designed to integrate with Basel II/III

“CreditMetrics™ was the last great open model in finance. ClimateMetrics™ could be the next.”

**🔹 6A. Who Should Fix This — Regulators, Banks, or Both?**

“There’s a tension here I want to be honest about.”

In the 1990s, it wasn’t regulators who created CreditMetrics™. It was banks. Voluntarily. Collaboratively. Publicly.

But today, we’re asking **regulators** to drive this change. Why?

**🧠 It’s because the system has changed:**

* Banks used to share models to shape the ecosystem.
* Now they’re penalized for sharing, or even for using someone else’s assumptions.
* Regulation has made the system more **stable** — but also more **rigid**.

“We’re in a place where **the only actor with enough freedom to coordinate change is the regulator** — even though they didn’t build the first version.”

**💭 So should we be asking regulators to *fix it* — or to *unblock it*?**

Maybe the better question is:

“Can we create a regulatory environment that **rewards collaborative infrastructure** like CreditMetrics™?”

* Could we:
  + Recognize public risk model contributions as a **Pillar 2 capital offset**?
  + Incentivize pre-competitive model development via **sandbox frameworks**?
  + Fund academic-industry collaborations through central banks or green investment programs?

“Regulators don’t have to write the next CreditMetrics™—but they could make sure whoever does *isn’t punished for trying.*”

“So if we want a ClimateMetrics™… who’s going to build it? And who’s going to make sure they’re allowed to?”

**🔹 7. Final Challenge to the Group**

“We’ve already built the machine. We just need to feed it the future.”

**💬 Discussion Prompts:**

1. Should PD and ρ be adjusted for climate risk under Pillar 1?
2. Who could build and maintain a ClimateMetrics™ model—regulators, academics, central banks?
3. Could capital requirements become the financial sector’s main contribution to a just transition?

**🔹 Closing Line**

“These formulas changed how we saw systemic financial risk. Climate is today’s systemic risk. Let’s put it in the model.”