1. **Elements on Financing for Development - a global financing framework (including cross-cutting issues)** by examining - *two future cash flows with identical yields, underlying borrowers, and maturities but with different duration or empirical contents*

Bank’s human decision maker and market participants when interested in ***to manage*** and ***to mitigate risks*** (i.e., expected losses) ***on their*** cash-flow related and non-cash-flow related ***investments;*** for example,

* ***market risk***out of cash-flow related and non-cash-flow related investments at their trading and banking book (portfolios), identified and quantified as “snap-shot” exposure, including expected climate-related financial risks or losses; will
* **use** ***“forward guidance”*** to identify and quantify by tools (i.e., models, scenario analysis…etc.) these at i.e., banks trading and banking books (portfolios) by their management (bank’s decision maker) expected or anticipated climate-related risks or **financial losses**.

However, **on the process** **to manage** and **to mitigate** expected climate-related financial risks including **financial losses**, **bank’s**  **decision maker** and **market participants** are **‘facing’ the challenge,** that even, when decision maker and market participants use open artificial intelligence (AI) – i.e., defined as combining semantic search with an iterative and semantic large language model (LLM) prompting to generate (‘not to derive’) semantic and language (‘not contents’) related statements or models (see, BIS March 2024. ‘*Project Gaia – Enabling climate risk analysis using generative AI’*, March 2024, Bank for International Settlements 2024, p.3) **that these open AI based** statements and **models** ‘may’ be **classified,** by some empirical scientists and decision maker using empirically testable and rejectable theories, as **non-empirical** (metaphysical) **statements** which do base on **un-rejectable theories**.

Empirical scientists and decision maker **applying empirically testable and rejectable**

**theories**, arenot interested in to refer by their decision making ***to un-reliable*** or

un-rejectable forward guidance (or ***forecasts***) (see, Pierre Wunsch. 2024. *Lessons from the*

*recent* *episode of high inflation; Keynote speech by* Mr. Pierre Wunsch, Governor of the National

Bank of Belgium; at the Eurofi High Level Semina, Ghent, 22 February 2024, page 2 and 3),

**might see** **themselves** ***being* *forced*** ***to manage*** *(i.e., to mitigate),* **at their** trading books

(portfolios) and banking books (**portfolios**) **identified** and quantified expected ***climate-***

***related*** *financial* ***losses.***

The decision maker will in all cases where **cash flows** with identical yields,

identical underlying borrowers, and identical maturities **differ** in their **durations** (see, Macaulay, Frederick R. 1938. *Some theoretical problems suggested by the movements of interest rates, bond* *yields, and stock prices in the United States since 1856.* Columbia University Press for the National Bureauof Economic Research, pp. 45 ff), that choosing **the lower duration cash flow,** as a ‘market’ decision rule, **will guide** decision makers looking for a trading partner **to make financial loss-mitigating decisions.**

**And, as bank’s decision maker and market participants** compare investment cash flows by their **degree of empirical contents** and **not by accumulating probabilities.** Only **one additional future payment** more **will mitigate** investors’ expected climate-related **financial losses**. **However, the probability of receiving this additional payment will be smaller**.

**Example:** “Let **a** be the installment, and **b** the final payment, and **a b** the installment and the final payment: it is then obvious that **the informative contents of the conjunction a b**, **will exceed** that of its component **a** and also that of its component **b**.

**But: The aggregated probabilities** or likelihoods **to receive**, these payments or items **a b will be smaller** than that of either of its components. Writing Ct (a) for the contents of the statement a, and Ct (a b) for the contents of the conjunction a and b, we have

Ct(a) <= Ct (a b) >= Ct(b) (1)

***This contrasts with the corresponding law of the calculus of probability***

p(a) >= p (a b) <= p(b) (2)

***where the inequality signs of*** *(1)* ***are inverted.***

Together, these two laws, (1) and (2), state that with increasing contents [receiving more than one payment which mitigates the outstanding amount], the aggregated probabilities [‘risk’] of receiving both outstanding items [payments] decreases, and vice versa; or in other words, that contents increase with increasing improbability. This trivial fact has the following inescapable consequences: ***if growth of science*** [or the mitigation of the risk receiving back an outstanding amount of money] ***means that we operate with theories of increasing contents*** [i.e., additional payments on coupon bonds, installment loans], ***it must also mean that we operate with theories*** [concepts] ***of decreasing probability*** [in the sense of calculating the probabilities or the ‘risk’ of receiving future payments]***.***

***Thus, if our aim is the advancement*** ***or growth of knowledge*** [or to mitigate expected losses (‘risk’) by installment payments], ***then a high probability*** *(in the sense of the calculus of probability)* [or by probabilities calculated ‘risk’] ***cannot possibly be our aim as well:*** ***these two aims are incompatible***” (see, Popper, Karl R. 1968. *Conjectures and refutations: the growth of scientific knowledge*. New York, NY: Harper & Row, chapter 10, paragraphs 2 and 3).

1. **Action areas**byexamining - *models or trading systems that claim* to reverse the process of risk diversification

There are models or trading systems that claim, **to reverse the process of risk diversification** by mechanics or invisible but market participants guiding forces which simultaneously - calibrate and allocate uncertainty, including climate-related financial risk.

**However,** “**data describing the historical relationship** *between climate-related impacts and their economic and financial consequences* **may not be representative of future climate-economy or climate-financial relationships**”. (See, Basel Committee on Banking Supervision. 2021. *Climate-related financial risks – measurement methodologies*. Basel, Switzerland: Bank for International Settlements, p. 10)

**And, “in assessing** the impact of the magnitude and timing of **climate risk drivers on banks’ exposures to climate-related financial risks**, **little reliance can be placed upon historical events**, giving rise to a high level of uncertainty. In addition, climate-related financial risks have unique characteristics relating to the complex interlinkages between transmission channels, longer time horizons, uncertainty and the non-linear nature of climate effects, **as well as the feedback loops between physical and transition risks**”. (See, Basel Committee on Banking Supervision. 2023. *Consultive document. Disclosure of climate-related financial risks.* Issued for comment by 29 February 2024, Basel, 2023, p. 2.)

I am endorsing **the Paris Accord** andtheby men kind widely acceptedneed **to decrease CO2 emissions** by ***empirical – testable and rejectable investments*** *outlined* ***at theories, concepts or models***, **even when** the current CO2 emissions decreasing **model obstacles**;

1. **no** worldwide **standardized and commonly agreed** (CO2) **definition** to emit one ton CO2 and the fact that
2. **one ton CO2** is currently **not a cross-border deliverable commodity**,

**do hinter** financial and carbon **markets participants** on their investments and trading operations **to manage** and **mitigate CO2 emission**.

**I am intending** to encourage CO2 market advocates **to erode** the **faith** of some of their colleagues, claiming being capable **to derive** deductively **a price** (> 0) **for the permit** (option) **to emit one ton CO2** by (**testable** but **un-rejectable) models**. Particularly, as it is currently and in the foreseeable future impossible - i.e., ***to derive deductively*** ***the price of one metric ton CO2*** generated, in 2024 at North Rhine Westphalia (NRW), Germany, as “global” **or** EU-wide CO2 equilibrium price, or ***as price***, calculated ***backwards*** in response ***to five (5) interrelated parameters*** i.e.,

- ***the price of* *the*** *permit or option* ***underlying*** i.e., one ton CO2;

- ***the strike price*** *of the permit or option* ***to emit*** i.e., one ton CO2;

- ***the risk-free rate of return*** also called the ‘real equilibrium interest rate’ (equivalent to an equilibrium or a natural interest rate) or **r\***” (see, Carney, Mark. 2016. ‘*Resolving the climate paradox’*, remarks by Mr. Mark Carney, Governor of the Bank of England and Chairman of the Financial Stability Board, Text of the Arthur Burns Memorial Lecture by Mr. Mark Carney, Berlin, 22 September 2016, p. 6); **or** “the ***natural rate of interest is a purely notional and unobservable variable***; it is intimately linked to a *specific* view of the inflation process, in which economic slack plays a key role; and *it is beyond* the influence of monetary policy. Importantly, the “existence” of such a rate does *not* imply that saving and investment directly determine any *market* interest rate. In fact, I [Mr. Borio] would argue, quite plausibly they do not” (see, Claudio Borio, November 2021, ‘*Navigating by r\*: safe or hazardous?* ‘BIS Working Papers, No. 982, p. 2; **and** see, Borio, Claudio, Ilhyock Shim and Hyun Song Shin. 2022. *‘Macro-financial stability frameworks: experience and challenges*,’ BIS Working Papers, No. 1057.); **or** “the ‘equilibrium' or ‘neutral' real interest rate is usually defined as the real interest rate required to close the output gap and sustain the inflation rate at its target. The equilibrium interest rate ***cannot be directly observed, and must be estimated***. Such estimates are typically highly uncertain and so are not used as a mechanical guide to monetary policy.” (See, Bailey, Andrew; Cesa-Bianchi, Ambrogio; Garofalo, Marco; Harrison, Richard; McLaren, Nick; Piton, Sophie; Sajedi, Rana. October 2022. ***‘****Structural change, global R\* and the missing-investment Puzzle’,* Bank of England (BoE) Staff Working Paper, No. 997, p. 3.);

- ***the movements* (volatility)** *in the underlying (commodity or asset) price* to emit one ton CO2, and

- ***the remaining time to maturity***, applied for valuing (‘pricing’) a **European** permit or **option to emit** i.e., EU-wide (in futureglobally) **one ton CO2**.

Calculating **backwards** an **option price** waspresented by Merton (1973) and Black and Scholes (1973) as **calculation** by ***empirical*** and ***‘observable’*** **parameters** and is also called - ***option pricing process at a ‘complete market’***. (See, Bellalah, Mondher. 2010. *Derivatives, risk management & value*. Singapore: World Scientific, p. 85.)

“The main attractions of the Black-Scholes model are that their **formula** is a function of **observable** variables **and** that **the model can be extended to** the pricing of **any** type of **option**” (see, Bellalah 2010, p. 377).

However, the Black-Scholes model option pricing process, even when operating in a ‘complete market’, does still base on ***four empirical******observable backwards calculated parameter*** and ***one*** obviously ***unobservable*** and therefore ***non-empirical variable r\*.***

1. **Emerging issues** by examining - *mechanics or invisible forces* guiding market participants *to calibrate* and *allocate* simultaneously their *uncertainties including climate-related risks*

Referring to above mentioned obstacles I am asking - is the Merton (1973) and Black and Scholes (1973) option pricing model – **a testable and rejectable** **model**? Particular, when the option or **permit pricing process,** **to** **emit** (on our planet) **one metric ton CO2** will be derived out-off a model which does base on ***four empirical******observable backwards calculated parameter*** and ***one*** ***unobservable*** and therefore ***non-empirical variable r\****.

The CO2 option price **to emit** at our planet **one metric ton CO2** calculated backwards, by the ***unobservable variable r\**** and four ***observable parameters***

1. should be an CO2 option **price** **-** achievable even **without** **properly defined** CO2 option **underlying** i.e., emitting one metric ton CO2 in China, India, or the European Union;
2. should be achievable **despite** CO2 originators (**accounting**) **differences at amortized costs** for one metric ton of CO2 originated in China, India, or at the European Union;
3. should be achievable **despite** the issue of **moral hazard** on CO2 originator (or issuer); and
4. should provide a **commonly agreed** price by worldwide CO2 originator (or issuer) - despite the fact that i.e., **a German** **buyer** of CO2 option certifying the permission to emit one metric ton CO2 originated in 2024 at China or EU country Italy, **is not ‘facing’** **the risk** that an Indian or Dutch seller of one ton CO2 originated in 2024 at China or the Netherlands, is **delivering one** metric **ton CO2** *taken out of the air* in 2024 at China or the Netherlands, as i.e., one metric ton CO2 comprised and filled in bottles, after paying the mutually agreed price by the German buyer to the Indian or Dutch seller, **as** **there are** currently **no cross border delivery** **agreements** between China or the Netherlands, India or Italy [even not within all European (EU) countries] **to deliver cross border** – metric tons of the **commodity** **CO2**.

**IV. Data, monitoring and follow-up**by examining - why financial and commodity market advocates like to promote *a symmetric relation* between *market price* or yield changes, and *climate-related financial risk exposure changes*

Simultaneous contents **and** probabilities maximizing human decision maker looking for a trading partner failed. As simultaneous contents **and** probabilities maximizing human decision-making ***turns traders and other market participants into contradictions*** which have either ***be ignored***, by the human decision-maker **and** their trading partner, or into idiots (i.e., ***sloppy, irresponsible traders who maximize ‘****value at risk’* ***and maximize*** *‘contents-based loan portfolio income’*). (See, Morgan, J. P. 2012. ‘*The case of structured products’*, Claire Célévier and Boris Vallée, What Drives Financial Complexity? A Look into the Retail Market for Structured Products, 2013 Business.)

However, EU-Banksdecision maker who are *accumulating* ***either*** *probabilities* **or** *informational contents*, will operate on their banking and trading books in compliance with the Basel Committee on Banking Supervision (the Committee or BCBS) proposal and recommendation i.e., **to apply on bank’s trading books** the by the BCBS recommended simplified standardized approach (**SSA**).

**According to the Committee** “**market risk or** **climate-related financial risks** **at banks** is defined as the risk of losses arising from movements in market prices. The risks subject to market risk capital requirements include but are not limited to: (1) default risk, interest rate risk, credit spread risk, equity risk, foreign exchange (FX) risk and commodities [*i.e., the permission to emit, during a one year reporting period, within the EU area, one metric ton CO2*] risk for trading book instruments; and (2) FX risk and commodities [*i.e., the permission to emit, during a one year reporting period, within the EU area, one metric ton CO2*] risk for banking book instruments” (see, Basel Committee on Banking Supervision 2019*, Minimum capital requirements for* *market risk*).

In case of market risk **or** climate-related financial risk exposure changes at banks, the Committee’s simplified standardized approach (**SSA**) does recommend on **banks** **trading book** **instruments** **for disclosure** (i.e., the permission to emit, during a reporting period of one year, within the EU area, one metric ton CO2)**,** **by referring to**

1. **one calendar-day trading time horizons** and a **one calendar-day** **transaction settlement** (delivery versus payment (DVP)) **for each instrument** (i.e., including the permission to emit, during one year reporting period, within the EU area, one metric ton CO2) **to calculate** (‘estimate’) an **end-of-trading day profit and loss (P&L);** out of
2. all traded instrument profits (‘margins’) over **a one calendar-day trading time horizon**, including all instruments with a (delivery versus payment (DVP)) transaction settlement **longer than one calendar-day**; and an estimated
3. **fair value** of all trading instruments **calculated under the SSA** in the bank’s **trading book** at the end-of-trading day and which will be **kept** (until the next trading day) **as trading instruments** (i.e., including the permit to emit, during one year reporting period, within i.e., the EU area, one metric ton CO2).

In all cases where the risk-weighted assets for market risk are determined under the SSA, **uncertainties** about future value developments, apart from the remaining *instruments to be traded the next day,* and *the estimated fair value of transactions with settlement of more than one calendar-day*, **are replaced *by a ‘certain’ end-of-trading day*** *profit and loss (****P&L****) at* ***trader’s*** *trading* ***account*** (see, Basel Committee on Banking Supervision. 2019. Minimum capital requirements for market risk. Basel, Switzerland: Bank for International Settlements, paragraph 40.1).

The simplified standardized approach (SSA) applied by banks at their trading books i.e., under an extended Pillar 3 framework for climate-related financial risk exposures **extended** by CO2 certificates providing the permit (i.e., within the EU) to emit one metric ton CO2.As well as by banks responsible staff daily prepared **‘snapshot’** **analysis** – about at banks trading (and in the future banking) books quantified and accumulated climate-related financial risk exposures, **is** ‘**unfortunately’** for banks management, and bank’s climate-related financial risk exposures supervising authorities **of limited prognostic power.**

However, the missing *‘harmonization in carbon* ***accounting practices****’*, and *a missing properly defined and* ***cross boarder*** *deliverable* ***carbon emission permit underlying*** *i.e., one metric ton CO2*. “Have led to carbon credits being treated [by market participants] with a degree of skepticism. To build ‘an efficient and trusted carbon market’, we will need better and verifiable abatement **data**, **harmonization in carbon accounting practices**, and **interoperability between the voluntary and compliance carbon markets**.” (See, Menon, Ravi, 2022. ‘*Net zero - act now, act fast, act together*’, speech by Mr. Ravi Menon, Managing Director of the Monetary Authority of Singapore, at COP27 Singapore Pavilion Finance Day, Sharm El-Sheikh, 9 November 2022, page 3.)

**And,** Mr. Ravi Menon continues; “*What we need is**public-private partnership in financing that is synergistic not duplicative. We need to make every dollar of public capital count. We need blended finance”.* (See, Menon, Ravi, 2023. ‘*A supervisory push for transition planning and blended finance*’, opening remarks (virtual) by Mr. Ravi Menon, Managing Director of the MonetaryAuthority of Singapore and Chair of the Network for Greening the Financial System, atthe Green Swan conference 2023, Basel, 31 May 2023, page 4.)

However, the recommendation **to apply a** financed ‘*cash-flow related* ***investment’* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions. This statement - mixing-up climate funding resources with carbon market mechanisms does convey an ***‘un-rejectable’ message*** to markets participants; ***there is*** *- a financed* cash-flow related investment ***and* -** *a non-cash-flow related* *(CO2) option price* ***which does,*** *if combined with* *a market mechanism* (delivery versus payment (DVP))*, will* ***mitigate (CO2) emissions***. As, the *market mechanism* combined with **a price** (> 0) **for the permit** (option) **to emit one ton CO2**, **enables investors** with CO2 emission mitigating investments “**to benefit** **from** more certainty concerning the future cash flows generated by carbon market activities in the context of **climate change mitigation programmes**”. (See, Mikolajczyk, Szymon; Imogen Long; Gabriela Martinez. 2022. ‘*Survey report on climate funding and carbon markets; Positions of key international climate funds, donor and recipient countries on blending climate funding with carbon markets.* Climate Focus, Amsterdam, the Netherlands, 18 October 2022, p. 2.)

**V. Overarching reflections** by examining - how to enable banks decision maker, external and internal supervisor to disclose and to manage climate-related financial risk exposure changes, by a *falsifiability or testability criterion* separating banks decision maker operations in contents maximizing or probability maximizing activities

As, it is of paramount importance for i.e., bank’s decision maker to work with ***empirically******fallible*** *(rejectable)* **Paris-compatible *transition plans*** *theories or models*. I am referring to by Mr. Popper***formulated*** *existential statement* ***in*** *purely* ***empirical terms*.**

“***There exists a finite sequence of Latin elegiac couplets such that, if it is pronounced in an appropriate manner at a certain time and place, this is immediately followed by the appearance of the Devil*** *- that is to say, of a man-like creature with two small horns and one cloven hoof”.* (See, Popper. 1968. Chapter 10, p. 249.)

And Mr. Popper argues: *“****Clearly, this untestable theory*** [i.e.,the devil-summoning spell*;* or - **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]***is, in principle, verifiable*.**

***I*** [Mr. Popper]***believe that the existential statement*** [*the devil-summoning spell*] ***is false: but I*** [Mr. Popper and the author do] ***believe that it*** [the devil-summoning spell; *or* – **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions] ***is*** *a false* ***metaphysical statement****.*

***Empirically, it is irrefutable. No observation in the world can establish its***[the devil-summoning spell; *or* – to apply a financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *if ‘blended’ or mixed-up,* mitigates(CO2) emissions]***falsity.******There can be no empirical grounds for its falsity.***

***Moreover, it can be easily shown to be highly probable: like all existential statements*** [the devil-summoning spell; *or* – **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions], ***it******is in an infinite*** [*or sufficiently large*] ***universe*** [i.e., like at open AI] ***almost logically true,* to use an expression of Carnap’s\***.**Thus, if we take it**[the devil-summoning spell; open AI; *the existence of a natural rate of interest as a purely notional and unobservable variable; or -* **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]**to be empirical*,* we have no reason to reject it***,* **and every reason to accept it** **and to believe in it – especially upon a subjective theory of probable belief.**

**Probability theory tells us even more: it can be easily proved not only that empirical evidence can***never refute***an almost logically true existential statement** [like the devil-summoning spell; **or** by open AI generated – languish (not contents) related, created answer; ***or*** – **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions], **but that it** [the devil-summoning spell; **or**by open AI generated – languish (not contents) related, created answer;***or*** – **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]**can***never reduce its probability****.***

(Its [the devil-summoning spells] probability could be reduced **only** by some information which is at least ‘almost logically false’, and therefore not by an observational evidence statement.)

**So the empirical probability or degree of empirical confirmation (**in Carnap’s sense\***) of our statement about the devil-summoning spell** [**or** open AIs probability-based answers; ***or*** *the statement about the existence of a* ***natural rate of interest r\**** *as a purely notional and unobservable variable;* ***or*** *the need for the falsifiability or testability criterion* when assessing the usefulness on banks ***transition plans*** i.e., **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]**must forever remain equal to unity, whatever the facts may be.”** (See Popper. 1968. Chapter 10, p. 249. And \* see, Carnap, Rudolf. 1959-1965. *‘An Axiom System for Inductive Logic: introduction’*, Rudolf Carnap Papers; Series; XXIII. An Axiom System of Inductive Logic (AS): Drafts and Dittos 1959-1964, p. 503.)

And Mr. Popper continues; “It would of course be easy enough for me to amend my criterion of demarcation so as **to include such purely existential statements** **among the empirical statements**. I merely should have **to admit** not only **testable or falsifiable** **statements** among **the empirical ones**, but also **statements which may, in principle, be** **empirically ‘verified’.**

But I [Mr. Popper] believe that it is better **not to amend** my original falsifiability criterion. For our example shows that, if we do not wish to accept my [Mr. Popper’s] existential statement about the spell that summons the devil[**or** the by open AI generated – languish (not contents) related, created answer; **or** *the statement about the existence of a ‘****natural rate of interest r\*’****as a purely notional and unobservable variable;* ***or*** *the need for the falsifiability or testability criterion* when assessing the usefulness on banks ***transition plans*** i.e., **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]**we must deny its empirical character**(notwithstanding the fact that it can easily be formalized in anymodel language[i.e., by an open AI generated – language] sufficient for the expression of even the most primitive scientific assertions).

**By denying the empirical character of my**[*Mr. Popper’s*]**existential statement**[the spell that summons the devil]*,* **I** [*Mr. Popper*]**make** **it possible to reject it** [the spell that summons the devil; **or** the statement about the existence of a *‘****natural rate of interest r\*’*** as a purely notional and unobservable variable*;* ***or*** *the need for the falsifiability or testability criterion* when assessing the usefulness on banks ***transition plans*** i.e., **to apply a** financed ‘*cash-flow related* ***investment’,* and** **a** *‘non-cash-flow related* ***option price’***which *- if ‘blended’ or mixed-up,* mitigates(CO2) emissions]**on grounds other than observational evidence**.*”* (See Popper. 1968. Chapter 10, p. 250.)