

Chapter 0 · Abstract

Capitalization Bus Theory (CBT) is a unified language for observing and analyzing economic and social phenomena.

It seeks to answer three fundamental questions:

1. How much Free Cash Flow (FCF) can be generated in the future?
2. What discount-rate structure (r-structure) do people and institutions use to price that future?
3. Under what Property Rights & Boundaries, and on which Buses, are the rights and obligations associated with these cash flows allocated?

The starting point is the classic discounted present value model:

$$EPV = \sum_{t=1}^{+\infty} [FCF_t / (1 + r)^t]$$

Where:

- EPV: Economic Present Value;
- FCF_t : Free Cash Flow in period t ;
- r : discount rate;
- t : time period ($t = 1, 2, 3, \dots$).

When FCF_t is relatively stable and the institutional and risk structures are relatively stable, simplified approximations may be used:

- If the long-term growth rate g is approximately 0:
 $EPV \approx FCF / r$
- If there is a stable growth rate g (with $r > g$):
 $EPV \approx FCF / (r - g)$

CBT's basic stance is: economics must be human-centric.

- The unit of analysis is the concrete actor, not a “representative individual” that averages away individual differences;
- Behind the variables lie time preference, psychological discounting, fear, and hope;
- Institutions, power, war, religion, and narratives all shape asset prices, industrial structures, and social stability by changing the structure of FCF and r .

CBT provides three things:

1. A “theoretical constitution” consisting of three axioms;
 2. A structured language for translating problems into FCF / r / Buses / Boundaries;
 3. A toolkit—including the Analysis SOP (Domain Gate + Four-Step Bus Analysis), the Bus Generation Interface, the Capability Bus, the Happiness Bus, the R-I-S-C Hierarchical State Map, and the Discount-Rate Scissors Gap (Δr)—for diagnosis and decision-making by individuals, firms, cities, and nations.
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Chapter 1 · Introduction: Why Do We Need “Bus Language”?

1.1 The Surface World and Deep Structure

Everyday economic discussion focuses on the surface world:

- GDP, inflation, unemployment, interest rates, exchange rates, and house prices;
- Corporate profits, valuations, market capitalization, and ROE;
- Urban investment, infrastructure, and population inflows and outflows;
- National growth, crisis, recession, and recovery.

These are all outcome indicators.

CBT is more concerned with the deep structure behind those outcomes:

- How actors make choices within finite lifetimes;
- How institutions define boundaries, rights, and obligations;
- Who uses power, narratives, and rules to control Bus switches and alter other actors' FCF and r ;
- How Negative Buses crowd out Positive Buses, and how the EPV of actors at the bottom is systematically compressed.

1.2 Four Core Objects of Analysis

CBT compresses the world into four core objects:

1. Actors: individuals, families, firms, governments, and organizations;
2. Free Cash Flow (FCF): cash remaining after basic survival and operating needs are met, whose use the actor can determine autonomously;
3. Discount-rate structure (r -structure): the way people and institutions discount the future;

4. Property Rights & Boundaries (Boundaries): the allocation of who holds which rights and obligations over what.

Any complex phenomenon can be translated through three questions:

- Where does Free Cash Flow come from, and where does it go?
- What does the discount-rate structure look like, and who is changing r ?
- How are Property Rights & Boundaries defined? Who occupies which Bus, and what position do they hold on it?

1.3 Scope and What CBT Does Not Do

CBT does not replace microeconomics, macroeconomics, corporate finance, or accounting; nor does it promise short-term price forecasts.

It is closer to:

- A “cross-context translator” that translates institutions, power, war, religion, and emotion into FCF, r , and Boundaries;
 - A “structural diagnostic tool” for long-horizon scenario analysis and crisis identification;
 - A coordinate system that allows discussions across different fields to be aligned in a common language.
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Chapter 2 · Three Axioms: Action, Time, and Boundaries

2.1 Action Axiom

Axiom 1:

Human beings act purposefully in an effort to move toward states they subjectively regard as better.

Explanation:

- “Better” is a subjective judgment, and standards differ from person to person;
- Action is based on expectation: “If I do this, the future will be somewhat better than if I do not”;
- Even when the expectation is wrong, the action itself remains purposeful.

Implications:

1. Action is the smallest unit of analysis in CBT.
 2. Markets, prices, institutions, firms, and even nations can all be traced back to the recurring choices made by groups of people under specific constraints.
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2.2 Time Axiom

Axiom 2:

Human life is finite, time is irreversible, and the future is uncertain.

Explanation:

- Time cannot be stored; it can only be used as it passes;
- Time used for A cannot be used for B. That is opportunity cost;
- Human beings generally exhibit positive time preference: other things equal, they prefer some benefit now to the same benefit later.

Implications:

1. The discount rate r must therefore be positive in logical terms ($r > 0$);
 2. Even in the absence of money and explicit interest, an implicit interest rate exists as long as time preference exists.
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2.3 Property & Boundaries Axiom

Axiom 3:

All economic action takes place within a structure of boundaries, which determines who holds what rights and obligations over what.

This can be captured in one highly intuitive sentence:

Human beings naturally understand what is “mine (ours)” and what is “yours (theirs).”

This means:

- Property rights and boundaries are not merely textbook constructs; they are a basic human foundation of cooperation and conflict;
- Institutions make this innate distinction between “mine” and “yours” explicit, procedural, and enforceable.

Boundaries determine:

- Who may possess, use, benefit from, and dispose of what;
- Who bears taxes, debts, responsibilities, and obligations;
- How stable and predictable these rights and obligations are.

Implications:

- The clearer and more stable the boundaries, the lower $r_{\text{institution}}$, and the more favorable the environment for long-horizon investment and the building of Positive Buses;
 - The more ambiguous or arbitrarily changeable the boundaries, the higher $r_{\text{institution}}$ and r_u , and the more likely short-termism, rent-seeking, plunder, and conflict become;
 - When institutions no longer provide a credible legal path for repair, society tends to resort to extreme forms of Boundary Rewriting, including violence, revolution, and coups.
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2.4 The Bridge from Axioms to Evaluation: CBT's Minimum Normative Position

The Action Axiom is subjectivist: “better” is defined by the actor. Yet CBT's evaluative language has a clear direction. On the source side, it favors $\text{FCF_Produce} + \text{FCF_Exchange}$ and is wary of $\text{FCF_Rent} / \text{FCF_Plunder}$; on the use side, it favors $\text{FCF} \rightarrow \text{P}$ and constrains $\text{FCF} \rightarrow \text{R} / \text{FCF} \rightarrow \text{S}$.

A serious question therefore arises: starting from subjective axioms, on what basis can one say that “production is preferable to plunder”?

CBT answers with a bridging argument rather than a purely logical deduction. The argument has three steps:

First, Axiom 2 (time and uncertainty) implies that any actor that wants “better” outcomes to persist needs a stream of future benefits that can continue over time, not merely a one-period gain.

Second, Axiom 3 (Property Rights & Boundaries) implies that FCF_Plunder and high-intensity FCF_Rent depend on the ability to rewrite boundaries arbitrarily. Once boundaries are shown to be subject to arbitrary rewriting, $r_{\text{institution}}$ and r_u rise for all actors—including the plunderers themselves—and the value of the future as a whole declines.

Third, therefore, under the subjective standards of “better” held by almost all actors, a system dominated by FCF_Produce is superior in the long run to one dominated by FCF_Plunder —not because of a moral declaration, but because the latter systematically destroys the conditions under which anyone can continue acting for the future. The scope of this judgment must be explicit: it applies mainly to actors and systems that must continue to act, exchange, and rely on stable boundaries in the future. For one-shot players that know they are near the endgame—terminal plunderers, actors certain to exit, or regimes that know they are about to fall—plunder may instead be subjectively optimal. This yields a reverse diagnostic insight: when an actor shifts from production toward plunder, the shift often reveals its true assessment of its own remaining time horizon.

It must be stated plainly that this bridging argument relies on an empirical premise: in most circumstances, most actors prefer a future that can continue. The premise is extremely robust, but it is not an a priori truth. Three points should therefore be made explicit:

First, CBT's non-moralizing analytical stance means that motives and moral labels are not used as substitutes for structural analysis;

Second, CBT is not value-free. It embeds a minimum normative judgment: sustainable positive-sum structures are preferable to zero-sum and negative-sum structures;

Third, this judgment is argued for rather than smuggled in. The purpose of this section is to make that argument explicit.

Chapter 3 · EPV: Economic Present Value and Approximation

3.1 Definition of EPV

Under a given institutional and risk structure, Economic Present Value (EPV) is the sum of the present values of the future Free Cash Flows FCF_t available to an actor, discounted back to today at rate r .

Formula:

$$EPV = \sum_{t=1}^{+\infty} [FCF_t / (1 + r)^t]$$

Where:

- FCF_t : discretionary cash flow in period t ;
- r : discount rate;
- t : time period (1, 2, 3, ...).

3.2 Perpetuity Approximations and Their Conditions

Perpetuity approximations may be used under the following conditions:

1. FCF_t is relatively stable, or fluctuates only moderately, over the long run;
2. The institutional and risk structures are relatively stable over the medium to long run;
3. A stable long-term growth rate g can reasonably be assumed (with $r > g$).

Two common approximations then apply:

- If g is approximately 0:
 $EPV \approx FCF / r$
- If there is a stable g :
 $EPV \approx FCF / (r - g)$

Notes:

- FCF denotes sustainable Free Cash Flow in a long-run “average” sense;
- g is the stable long-term growth rate;
- r is the long-term discount rate.

3.3 When the Simplified Formula Should Not Be Used

The simplified formula is inappropriate when:

- FCF_t fluctuates violently—for example, under strong cyclical, extreme risk, or rapid structural transformation;
- There is a risk of institutional rupture, such as war, monetary reset, coup, or systemic sanctions;
- The uncertainty premium r_u is very high, so the future may contain structural jumps.

In such cases, one should:

- Use an explicit time series by specifying FCF₁, FCF₂, ..., FCF_T;
- Or estimate EPV through scenario trees and probability weighting.

3.4 Validity Condition I: Hard Budget Constraint

$EPV = FCF / r$ contains an implicit premise that had not previously been made explicit:

The actor must genuinely bear the profit-and-loss consequences of its own FCF.

This is the Hard Budget Constraint. Four tests are useful:

- 1) Can failure be allowed to have consequences? Can a persistently loss-making structure be allowed to die?
- 2) Can errors be cleared? Can mistaken investments be liquidated and restructured?
- 3) Can losses be stopped? Can losses be recognized promptly rather than rolled forward and concealed?
- 4) Can accountability be restored? Can the consequences of a decision be borne by the decision-maker?

Under a Soft Budget Constraint—where losses are not cleared, losses can be externalized, and someone is always expected to provide a backstop—both FCF and r are institutionally distorted. The actor's FCF contains an unsustainable support component; its r is artificially suppressed and does not reflect true risk. The resulting EPV is therefore no longer a genuine signal, but an institutional illusion.

This yields a formal implication of the Property & Boundaries Axiom:

Implication: by default, EPV is a genuine signal only under a Hard Budget Constraint. Under a Soft Budget Constraint, EPV has reference value only after explicit decomposition.

There are four operational implications. First, before analyzing any actor, determine whether its budget constraint is hard or soft. Second, long-standing fiscal transfers, policy subsidies, and implicit guarantees are not inherently valueless, but they must be modeled explicitly as FCF_{Transfer} and as policy-backed support Buses; they must never be mixed into FCF_{Produce}. The greatest risk in analyzing soft constraints is not an inability to model them, but that the act of modeling itself becomes a device for sanitizing a misclassification. Third, the EPV of a soft-constraint actor—such as a firm, platform, or local financing structure that is persistently backstopped—must be presented as two separate components: Stand-Alone

EPV + Support-Backed EPV. The support-backed component must separately assess the support provider's withdrawal conditions and probability of withdrawal, which is precisely the variable that is hardest to estimate. Reporting a single merged EPV number is prohibited. Fourth, the larger the share of soft-constraint actors in a system, the less credible that system's aggregate EPV becomes.

3.5 Validity Condition II: Reflexivity Boundary

Point-estimate EPV has a second failure condition: a reflexive environment.

$EPV = FCF / r$ implicitly assumes that the numerator and denominator can be estimated independently. That assumption fails in the following loop:

A narrative becomes widely accepted → financing becomes more available → capital inflows change the fundamentals → the change in fundamentals “validates” the narrative → the narrative strengthens further.

Within such a self-reinforcing—or, in the opposite direction, self-unraveling—loop, FCF is no longer independent of market expectations about FCF; r is no longer independent of the capital inflow itself. A point estimate of EPV may severely overestimate or underestimate value, and the direction of the error changes with the phase of the loop.

Three signals indicate a reflexive environment: valuation is supported mainly by narrative rather than verified cash flow; financing itself has become a major driver of fundamentals; participants routinely substitute “what will others think?” for “what is the asset worth?”

Treatment rule: once a strong reflexive environment is identified, point-estimate EPV must not be used. Switch to a scenario tree plus loop-phase assessment; specify which phase of the loop is currently operating (self-reinforcing / critical / self-unraveling); and treat “when will the loop break?” as the primary analytical question rather than “what is the asset worth?”

Together with Section 3.3, this section defines three classes of failure conditions for the simplified formula: violent fluctuation, risk of institutional rupture, and reflexive loops.

Chapter 4 · Free Cash Flow (FCF): Uses and Sources

4.1 Definition of FCF

FCF (Free Cash Flow):

FCF is the cash flow that remains in a period after deducting the expenditures necessary to maintain the actor's basic survival and operation, and whose use the actor can determine at its own discretion.

It may be written as:

$FCF = \text{Income} - \text{Necessary Expenditure} - \text{Maintenance Expenditure}$

4.2 Use Structure: $FCF \rightarrow P$ / $FCF \rightarrow R$ / $FCF \rightarrow S$

By use, FCF is decomposed as follows. Note that $FCF \rightarrow P$ / $FCF \rightarrow R$ / $FCF \rightarrow S$ belong to the use structure, not the source structure. $FCF \rightarrow B$ also belongs to the use structure rather than the source structure; it makes visible those uses that are not immediately converted into P/R/S but are critical to system survival and recapitalization capacity.

$$FCF = FCF \rightarrow P + FCF \rightarrow R + FCF \rightarrow S$$

When balance-sheet uses need to be made explicit, the expression may be extended to:

$$FCF = (FCF \rightarrow P) + (FCF \rightarrow R) + (FCF \rightarrow S) + (FCF \rightarrow B)$$

where $FCF \rightarrow B$ denotes retention, debt service, reserves, and financial buffers.

1. $FCF \rightarrow P$ (Production Use)

Used to strengthen future production and service capacity, for example:

- Equipment, processes, and R&D;
- Education, training, and talent acquisition;
- Brand and reputation building;
- Infrastructure and process optimization.

2. $FCF \rightarrow R$ (Rent-seeking Use)

Used to acquire or maintain privileged positions, for example:

- Licenses, quotas, and relationship networks;
- Costs incurred to exploit policy gaps;
- Non-productive investment used to obtain monopoly or quasi-monopoly positions.

3. $FCF \rightarrow S$ (Show / Signaling Use)

Used for status display and signaling, for example:

- Prestige projects and image projects;
- Excessive decoration, large ceremonies, luxury consumption, and similar expenditures.

The long-run quality of an actor depends to a large extent on:

- Whether $FCF \rightarrow P$ accounts for a sufficiently high share of discretionary FCF;
- Whether $FCF \rightarrow R$ and $FCF \rightarrow S$ are reasonably constrained.

4.3 Source Structure: $FCF_{Produce}$ / $FCF_{Exchange}$ / FCF_{Rent} / $FCF_{Transfer}$ / $FCF_{Plunder}$

Looking only at uses is not enough; we must also ask where FCF comes from. Its sources can be broadly divided into:

1. $FCF_{Produce}$ (Production Creation)

- New value created by organizing labor, capital, and technology.

2. $FCF_{Exchange}$ (Normal Exchange)

- Returns obtained through voluntary exchange and the division of labor.

3. FCF_{Rent} (Rent Extraction)

- FCF extracted from other actors by occupying institutional gaps or monopoly positions.
- 4. FCF_Transfer (Transfers)
 - Tax redistribution, subsidies, welfare, relief, and similar transfers.
- 5. FCF_Plunder (Plunder and Expropriation)
 - Obtained through coercion, violence, or arbitrary confiscation.

The “quality of growth” of a nation, city, or firm can be assessed by asking two questions:

On the source side: does FCF come primarily from FCF_Produce + FCF_Exchange?

On the use side: does FCF flow primarily toward FCF→P?

4.4 Nonlinearity and Threshold Effects (Methodological Note)

In reality, the effects of FCF sources and uses on future EPV and r are often nonlinear:

- The marginal return on education and health investment may become significant only after a threshold is crossed;
- Once rent-seeking expenditure reaches a critical level, it can create a “lock-in effect” on institutions;
- Once conspicuous consumption crosses a social-psychological threshold, it can materially raise r_s and r_u .

For clarity, CBT represents such nonlinearities through “structure + criteria” rather than forcing them into unnecessarily complex formulas.

Chapter 5 · Discount Rate r : Structural Decomposition, Dynamics, and the Scissors Gap

5.1 Decomposition of the Discount Rate

The discount rate r determines how much the future is worth today.

CBT decomposes r into multiple components:

$$r = r_0 + r_{\text{policy}} + r_{\text{institution}} + r_{\text{geo}} + r_u + r_s$$

Where:

- r_0 : base rate (time-preference baseline);
- r_{policy} : policy and macro-environment component;
- $r_{\text{institution}}$: institutional and rule-of-law component;
- r_{geo} : geopolitical-risk component;
- r_u : uncertainty premium (tail-risk component);
- r_s : social subjective discount rate (collective-psychology component).

At the individual level, one may additionally define:

- r_{psy} : individual psychological discount rate.

At the decision-center level—governments, central banks, senior management of large firms, and similar bodies—one may define:

- $r_{decision}$: decision-center discount rate.
At the national level, r_g is often used to denote the implicit discount rate of the government or policy-making authority.

5.2 Meaning of Each Component

1. r_0

- Derived from the Time Axiom, it is the baseline preference between benefits now and benefits later under idealized conditions.

2. r_{policy}

- The effect of monetary, fiscal, industrial, and regulatory policies—and of their stability—on expectations about the future;
- The more frequently policy swings or is made ad hoc, the higher r_{policy} .

3. $r_{institution}$

- Property-rights protection, contract enforcement, judicial credibility, and the degree to which public power is constrained;
- The more selectively institutions are enforced or arbitrarily changed, the higher $r_{institution}$.

4. r_{geo}

- Risks from external shocks such as war, sanctions, blockades, and supply-chain security disruptions.

5. r_u

- The possibility of irreversible jumps in future outcomes: coups, institutional collapse, monetary reset, large-scale disorder, and similar events;
- It is the price of tail risk.

6. r_s

- Society-wide confidence in and patience toward the future:
 - Whether people believe the future will be better;
 - Whether they are willing to make long-term commitments;
 - Whether cynicism or a “live for today” mentality is widespread.

7. r_{psy}

- The degree to which an individual subjectively discounts the future;
- Affected by perceived security, formative experience, family structure, status anxiety, faith, and related factors.

8. $r_{\text{decision}} / r_{\text{g}}$

- The degree to which a decision center discounts the future when setting policy, planning projects, and allocating resources;
- At the national level, it can be read as the “time preference” of the government or policy-making authority.

5.3 Rules for Distinguishing r_{psy} , r_{s} , and r_{u}

The three can be distinguished using the following logic:

- If a factor mainly affects whether an actor is willing to wait and how patient it is, it belongs more naturally to r_{psy} at the individual level or r_{s} at the social level.
- If a factor mainly affects whether the future might suddenly collapse or the rules might rupture, it belongs more naturally to r_{u} , the tail-risk premium.
- If a factor is an external conflict or sanction but has not yet reached the level of rupture, it is reflected mainly in r_{geo} ; if it escalates into a risk of irreversible rupture, the relevant portion shifts into r_{u} .

5.4 The Dynamic View of r : $r(t)$

In practice, r varies over time; it is better represented as a sequence $r(t)$ than as a constant:

- Policy changes, institutional reform, war, and crisis may each alter the structure of r at particular moments;
- When analyzing the long-run trajectory of a nation, industry, or firm, time often needs to be divided into several phases, with a different r -structure applied to each.

For simplicity, CBT often uses a piecewise-constant approximation—for example, one r -structure for a country from 2000–2010 and another from 2010–2020.

5.5 Decision-Center Discount Rate and the Scissors Gap Δr

In any system with a “decision center”—a nation, city, large firm, or major organization—we can define a decision-center discount rate r_{decision} and compare it with the discount rate r_{s} of society or ordinary actors.

Let:

- r_{decision} : decision-center discount rate;
- r_{social} : subjective discount rate of social actors (usually approximated by r_{s});

Define the Scissors Gap Δr :

$$\Delta r = r_{\text{social}} - r_{\text{decision}}$$

At the national level, the common notation is:

- r_g : discount rate of the government or policy-makers;
- r_s : social subjective discount rate;
- $\Delta r = r_s - r_g$.

Intuitively:

- When $\Delta r > 0$:
 - The decision center is more “patient,” while society discounts the future more heavily;
 - Decision-makers at the top discuss twenty-year plans, while those below focus on next month's cash flow;
 - Long-term projects require additional persuasion and compensation, and long-range planning risks remaining rhetorical rather than being implemented.
- When $\Delta r < 0$:
 - Society is willing to commit to the long term, while the decision center is short-horizon or repeatedly changes course;
 - Long-term investment and innovation are easily interrupted by policy swings or short-horizon performance metrics;
 - Society experiences a sense that “the path is visible, but cannot be taken.”

The Scissors Gap Δr is not a new component of r . It is an indicator of inter-actor misalignment:

It measures the alignment between the time preferences of the decision center and ordinary actors, as well as the tension between long-term narratives and real incentives.

Δr will recur throughout the later analysis of nations, cities, institutions, and power.

Chapter 6 · Capitalization Bus: The World as a Network of Routes

6.1 Definition of a Bus

Intuitively, a Bus is a route that can generate sustainable FCF under repeatable conditions and for which an r -structure can be meaningfully specified.

Formal notation:

$\text{Bus}_i = \{ \text{FCF}_i(t), r_i(t), \text{Holders}_i, \text{Boundaries}_i \}$

- $\text{FCF}_i(t)$: the sequence of Free Cash Flows generated by Bus i across periods;
- $r_i(t)$: the discount-rate structure corresponding to that Bus;
- Holders_i : the parties that share benefits and bear costs on the Bus (shareholders, creditors, labor, government, households, etc.);
- Boundaries_i : the property-rights and institutional boundaries that support the Bus.

Identification criterion (concise version):

If a mechanism can generate FCF sustainably under repeatable conditions and an r-structure can be meaningfully specified for it, it is a Bus; otherwise, it is closer to a one-off opportunity, an inventory position, or a pure narrative.

6.2 Positive Buses and Negative Buses

1. Positive Bus

- A route expected to generate net positive FCF over the long run—for example, a high-quality firm, effective education, health investment, or sound infrastructure.

2. Negative Bus

- A route with a priority claim on future FCF, for example:
 - Principal and interest on various forms of debt;
 - Pensions, medical insurance, rigid fiscal expenditure, implicit guarantees, and similar commitments;
 - War debt and long-term costs of maintaining security and stability.
- A Negative Bus does not necessarily create additional value itself, but it has priority in absorbing future FCF.

6.3 Checklist for Identifying Negative Buses

Anything that must be serviced first in a crisis can be treated as a Negative Bus. The main categories include:

- Contractual Negative Buses: principal and interest on loans and bonds, leases, valuation-adjustment agreements, and similar obligations;
- Institutional-commitment Negative Buses: pensions, medical insurance, rigid fiscal expenditure, implicit local-government debt, and similar commitments;
- Political / narrative-commitment Negative Buses: implicit guarantees of repayment, bailout expectations, and institutions or projects considered “too important to fail”;
- War- and mobilization-related Negative Buses: long-term military expenditure, war debt, postwar reparations, sanction-hedging costs, and similar burdens.

The larger and more rigid the Negative Buses, the more they crowd out the space available for FCF→P on Positive Buses.

6.4 Bus Networks and the Crowding-Out Effect

An economy can be viewed, in essence, as a network of Buses:

- How many Buses are there?
- Which are Positive Buses, and which are Negative Buses?
- How is finite FCF allocated among the Buses?

A typical structural problem is:

- Negative Buses keep expanding;
 - The growth of total FCF slows or even turns negative;
 - As a result, $FCF \rightarrow P$ on Positive Buses is crowded out, and the quality of education, maintenance, R&D, and infrastructure deteriorates;
 - $FCF \rightarrow R$ rises as parties compete through rent-seeking for the remaining resources;
 - r_s and r_u rise as social confidence erodes and perceived tail risk intensifies.
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6.5 Bus Generation Interface: Entrepreneurial Experiments and Candidate Futures

6.5.1 Why a “Bus Generation Interface” Is Needed

Section 6.1 defines a Capitalization Bus as:

$Bus_i = \{ FCF_i(t), r_i(t), Holders_i, Boundaries_i \}$

and stipulates that if a mechanism can generate relatively stable FCF under repeatable conditions and an r -structure can be meaningfully specified for it, the mechanism may be identified as a Bus.

This definition answers the question: how should a Bus that has already formed be identified, analyzed, and capitalized?

Logically, however, it leaves a prior question unresolved: how does a Bus that does not yet exist gradually acquire the qualifications to become a Formal Bus from an unverified conjecture about the future?

New products, technologies, organizational forms, business models, and boundary structures do not naturally begin with stable FCF and a clearly defined r -structure. They usually pass through an earlier sequence:

Future conjecture $\rightarrow$ Real Resource Commitment $\rightarrow$ real-world experiment $\rightarrow$ external validation $\rightarrow$ continuation, restructuring, or exit

Most experiments fail. A small minority gradually develop repeatable exchange, relatively stable Boundaries, and identifiable FCF, and only then enter Formal Bus and capitalization analysis.

This section therefore adds a limited “Bus Generation Interface.”

It does not construct a complete equation of innovation generation, nor does it attempt to predict who will become a successful entrepreneur, what the next major innovation will be, or the precise probability that a new project will succeed. Why a specific piece of new knowledge, idea, or recombination is proposed by a particular actor at a particular moment still involves dispersed knowledge that cannot be centrally calculated, subjective judgment, and historical contingency.

This section addresses only three questions:

- 1) How should futures that have not yet formed be distinguished from futures that can already be capitalized?
- 2) What minimum conditions must a conjecture about the future satisfy before it can enter Proto-Bus status?
- 3) How do institutions and budget constraints affect the validation, failure, exit, and eventual formation of Proto-Buses?

V3.54 adopts a restrained position here: the specific content of novelty is not modeled in advance; the generation ecology can be analyzed; and the selection mechanism can be observed.

CBT does not predict what the next future will be, but it can analyze whether a system allows enough conjectures about the future to be proposed, tested in real-world experiments, allowed to fail in a timely manner, and—when a small number prove viable—allowed to continue growing.

6.5.2 Generation Domain and Capitalization Domain

To avoid forcing every unrealized future into EPV, CBT distinguishes the Generation Domain from the Capitalization Domain.

I. Generation Domain

The Generation Domain is the stage in which a new product, technology, organization, mode of exchange, or boundary structure has not yet formed a stable Bus, and its future FCF, Holders, and Boundaries are still being tested and formed.

At this stage, future cash flow may not yet exist; whether demand exists may not yet have been validated; who will ultimately own the rights to returns and bear the costs may not yet be stable; transaction and property boundaries may still be changing; and therefore a stable valuation object does not yet exist.

The Generation Domain is not simply an “ultra-high-risk segment” within the Capitalization Domain.

The problem is not merely that r is very high; rather, r does not yet have a stable object to which it can attach.

Before a Bus has formed, we may not even be able to answer consistently: which FCF is to be discounted; who owns the future returns; which boundary structure will ultimately hold; or what economic object the current experiment will eventually become.

For an existing Bus with high uncertainty, we at least know what object is being analyzed even if we do not know how its future will unfold. In the Generation Domain, the valuation object itself is still being generated.

II. Capitalization Domain

A mechanism enters the Capitalization Domain—and becomes suitable for Formal Bus analysis and EPV analysis—only when it has gradually acquired relatively repeatable exchange or resource flows, identifiable FCF, relatively stable Holders, describable and enforceable Boundaries, and an r -structure that can be meaningfully specified.

Unformed future → real experiment → Proto-Bus → selection and clearing → Formal Bus → capitalization

III. A Proto-Bus Must Not Be Assigned a Steady-State EPV Directly

Because a Proto-Bus has not yet formed stable FCF, r , Holders, and Boundaries, it should in principle not be valued directly with the steady-state approximations $EPV \approx FCF / r$ or $EPV \approx FCF / (r - g)$.

At the Proto-Bus stage, phased budgets, milestones, scenario trees, staged resource commitments, validation horizons, and Death Conditions are more appropriate.

This does not mean that a Proto-Bus cannot have a market price or financing valuation. Capital markets can still assign prices to a team, technology, exclusive resources, future experimentation rights, and optionality on a staged basis.

A Proto-Bus transaction price or financing valuation does not establish that the underlying Bus has already formed, nor that steady-state EPV can already be calculated reliably.

Financing price $\neq$ Formal Bus confirmation $\neq$ steady-state EPV

At the Proto-Bus stage, financing prices and financing capacity may in turn change the resources available

to a project and thereby affect technical, organizational, and market-validation outcomes. Price and expectations can therefore shift from being “results” to becoming “causes,” creating the reflexive feedback described in Section 3.5. V3.54 merely marks this interface and does not construct a complete dynamic model of reflexivity here.

6.5.3 Entrepreneurial Function and Accounting Asymmetry

In CBT, the entrepreneur is understood primarily not as a fixed identity, occupation, or personality type, but as an action function.

The Entrepreneurial Function is the action function through which an actor, when the future cannot yet be fully calculated, commits real resources on the basis of local knowledge and subjective judgment; changes existing combinations of resources, organizational forms, transaction relationships, or boundary structures; and accepts feedback from reality as a test of the actor's conjecture about the future.

An Entrepreneurial Experiment contains at least four elements:

First, subjective judgment

The actor judges that a new future state may be better than maintaining the status quo. The judgment may be right or wrong. The entrepreneur does not possess an objective answer about the future.

Second, Real Resource Commitment

The actor must actually bear some opportunity cost—for example time, capital, credit, reputation, career opportunities, organizational resources, or certain returns from an existing Bus. A narrative about the future that involves no Real Resource Commitment is not an Entrepreneurial Experiment in the sense used here.

Third, real-world experiment

The actor must change the status quo through real action—for example by developing a product, building an organization, changing a production process, creating a new mode of exchange, recombining existing resources, or redefining a set of executable rights and Boundaries.

Fourth, a real possibility of failure

The experiment must face some form of feedback from reality that the actor cannot fully reinterpret, cancel, or defer indefinitely—for example customers refusing to buy, technology failing to work, costs failing to be covered, an organization failing to survive, a key hypothesis being falsified, resources running out, or an alternative solution winning.

If a purported “innovation” can never, even in principle, be judged a failure, it is closer to an unfalsifiable narrative than to an Entrepreneurial Experiment.

Accounting Asymmetry of Entrepreneurial Action

Entrepreneurial action has an important ex ante structure: the sacrifice side is usually observable or partially measurable, while the future-claim side cannot yet be fully priced.

The cash, time, foregone income, equipment, credit, reputation, and organizational resources committed by the actor can usually be observed at least in part; but the future the actor is attempting to open may have no stable FCF, no reliable probability distribution, no mature market price, and perhaps not even a stable definition as an asset.

Entrepreneurial action is therefore not simply “commit known capital → purchase an already priced future asset.” It is closer to:

Using an observable sacrifice in the present to conduct a real experiment on a future that cannot yet be fully capitalized.

For identification, three ideal types may be used:

Investment-type action: the sacrifice side is measurable + the future claim is broadly priceable.

Entrepreneurial-type action: the sacrifice side is measurable + the future claim cannot yet be fully priced.

Purely narrative action: Real Resource Commitment is insufficient; the action relies mainly on language, financing narratives, identity performance, or having others bear the principal costs.

These are only structural ideal types, not permanent classifications of people. The same person may, across different decisions, act as an investor, an entrepreneur, or a promoter of narratives.

6.5.4 Proto-Bus: Admission, Death Conditions, and the Genealogy Ledger

To describe a structure that is not yet mature but has already entered real experimentation, CBT introduces a limited transitional concept:

Proto-Bus: an early-stage structure with Real Resource Commitment, a clear Core Hypothesis, a real-world validation interface, and an Effective Death Condition, but which has not yet met the criteria for a Formal Bus.

Idea $\neq$ Proto-Bus $\neq$ Bus

An idea, paper, business plan, policy slogan, financing story, or early-stage project does not automatically become a Proto-Bus merely because it “might succeed.”

I. Four Minimum Admission Criteria for a Proto-Bus

Criterion 1: Real Resource Commitment. At least one actor must genuinely bear opportunity cost.

Criterion 2: a clear Core Hypothesis. It must be possible to state what real-world structure the experiment hypothesizes can work.

Criterion 3: an External Validation Interface. There must be feedback from the real world; success cannot be defined entirely inside the project itself.

Criterion 4: an Effective Death Condition. A Proto-Bus must be constrained by a genuinely effective Death Condition. The condition may be structural or declared; at least one of the two must exist.

II. Structural Death Conditions

A Structural Death Condition is an exit mechanism naturally created by real budget constraints, such as depletion of the cash runway, inability to obtain follow-on financing, inability to repay debt when due, contract termination, persistent customer refusal to buy, bankruptcy, or market exit.

A project operating under genuine profit-and-loss responsibility may already face a strong Structural Death Condition even if no formal “death agreement” has been written.

A Structural Death Condition must have actual constraining force rather than existing only formally.

If a project can continually bypass its original Death Condition through unlimited related-party funding, implicit guarantees, fiscal backstops, persistent loss coverage by a parent company, or non-market refinancing, then its Structural D has been weakened or even dismantled.

Whether a Structural Death Condition has real constraining force should not be judged only from formal bankruptcy rules, financing terms, or cash-runway arrangements. It should also be assessed against the ex ante soft-budget indicators listed under Prediction 1 in Section 6.5.6, including the nature of the funding

provider, guarantee structures, historical rescue records, budget-continuation mechanisms, and arrangements that externalize losses.

III. Declared Death Conditions

When the Structural Death Condition has been materially weakened, a substitute constraint should be established through an ex ante registered Declared Death Condition.

$D = \{ T, \text{Evidence}, \text{Exit Rule} \}$

Here, T is the Validation Horizon; Evidence is the Minimum Evidence that must appear; and Exit Rule is the rule for exit, scaling down, or re-registration that should be triggered if the evidence does not appear.

A project with neither an effective Structural Death Condition nor an effective Declared Death Condition does not qualify as a Proto-Bus.

Declared D must not be merely formal. T should be broadly commensurate with the sustainable runway of committed resources, the technology-development cycle, and the structure of key milestones. An ultra-long T that clearly exceeds the resource horizon and lacks intermediate validation nodes is, in principle, an invalid Death Condition.

A typical case is an internal corporate innovation project. Because the parent organization can continue supplying resources, the Structural D originally provided by the market can easily be dismantled by internal budgets. Such projects therefore usually need Declared D, milestones, and stop-loss discipline more than independent entrepreneurial projects do.

IV. Soft Budget Constraints and Death Conditions

Section 3.4 already discussed Hard Budget Constraints. Here we can make a further operational inference: an important manifestation of a Soft Budget Constraint is the systematic dismantling of Structural Death Conditions.

Losses, cash depletion, payment failure, or customer rejection that would ordinarily trigger exit no longer cause resources to stop flowing. Declared Death Conditions then become a substitute constraint.

Declared D is not mandatory paperwork for every Entrepreneurial Experiment. It is a substitute discipline that becomes particularly necessary when Structural D has failed or been materially weakened.

V. Core-Hypothesis Change and Re-registration

Real-world experiments may be adjusted and reasonable pivots are allowed, but parameter adjustment must be distinguished from a change in the Core Hypothesis.

If the changes involve only pricing, product optimization, sales methods, or cost structure, while the core value proposition and the basic object of validation remain unchanged, the original Proto-Bus may continue.

But if the core customer, value proposition, principal FCF source, key technical route, or core boundary structure changes materially, the original Core Hypothesis should in principle be treated as ended and the new Core Hypothesis re-registered as a new Proto-Bus. The new Proto-Bus should reset its validation object, Validation Horizon, Minimum Evidence, and Death Conditions.

VI. Proto-Bus Genealogy Ledger

Re-registration does not erase history. Every newly registered Proto-Bus should retain the record of prior experiments, including the prior Core Hypothesis, prior Death Conditions, actual validation outcomes, reasons for falsification or exit, major resources already consumed, what changed in the current Core Hypothesis, and whether new high-quality external validation has accumulated.

This constitutes the Proto-Bus Genealogy Ledger.

The Genealogy Ledger has two uses. As an analytical tool, an analyst can reconstruct it ex post from available financing records, project announcements, board documents, product changes, customer records, and public information. As a governance tool, boards, fund managers, LPs, strategic investors, or providers of public capital can use it as a record-keeping discipline for subsequent resource commitments.

Its purpose is not to punish failure. Genuine Entrepreneurial Experiments must allow for failure and redirection. It is intended to prevent repeated failure from being disguised as one uninterrupted long-term exploration through repeated changes of name, sector, or metric.

Frequent re-registration and persistent resource consumption without long-run accumulation of high-quality external validation are important warning signals of Zombie State.

6.5.5 Validation Tiering, Hard Budgets, and Zombie State

The appearance of a first revenue stream does not automatically prove that a new structure has formed a Stand-Alone Bus. Transaction signals themselves can be manufactured by support, related-party relationships, or institutional arrangements. Validation evidence for a Proto-Bus must therefore be recorded in tiers. A-, B-, and C-Class validation must not be collapsed into a single “total amount of validation.”

A-Class: Stand-Alone Validation

Typical features include non-related-party transactions; counterparties using their own budgets; counterparties having real alternatives; prices not being created mainly by subsidies; and transactions having the potential to repeat or expand.

A-Class validation mainly asks whether the structure is beginning to generate stand-alone demand and exchange capacity independent of a specific supporter. It provides the strongest evidence for the future formation of a Stand-Alone Commercial Bus.

B-Class: Support-Backed Validation

Examples include fiscal subsidies, policy-driven procurement, strategic government procurement, industrial support, and explicit or implicit price support.

B-Class validation still has evidentiary value. It may show that a technology works, that a product has functional value, that genuine public demand exists, or that a strategic need warrants sustained resource expenditure. But it cannot by itself establish stand-alone commercial viability once the current support structure is removed.

Government procurement illustrates this particularly well. The issue is not whether the customer is the government, but whether the exchange corresponds to a persistent genuine functional demand or is mainly intended to keep a particular entity alive.

A Functional-Demand Counterfactual Test can be used: if the project exits, would the resource provider still be willing to spend a broadly comparable budget to obtain the same type of function or outcome—for example by switching to an alternative supplier, alternative technology, an import solution, or funding alternative R&D? If the demand remains while only the implementation changes, it is closer to genuine demand; if the demand itself disappears when that specific entity ceases to exist, it is closer to rescue support.

Genuine demand attaches mainly to the function; rescue support attaches mainly to the survival of a particular entity.

C-Class: Related-Party Validation

Examples include parent-company procurement, transactions with affiliated companies, orders arranged by controlling shareholders, internally circular revenue, or transactions manufactured for financing or performance evaluation.

C-Class validation can help prove whether technology works, processes function, and an organization can deliver, but it cannot directly prove the existence of independent market demand.

A-, B-, and C-Class validation should be recorded separately and must not be merged into a single validation metric. A Proto-Bus must not report only that it “already has revenue, already has customers, or already has orders”; it must also answer: what kind of revenue, customers, and orders are these?

This discipline is consistent with the principle in Section 3.4 that Stand-Alone and Support-Backed structures must not be reported as one combined number.

Hard Budget Constraint: the Selector in the Generation Mechanism

The main theory has already stated that EPV has more reliable signaling value only under relatively genuine Hard Budget Constraints. At the Bus-generation stage, the Hard Budget Constraint serves another function: it determines whether failed candidate futures can exit and thereby release experimental resources.

Future conjecture → resource commitment → real-world experiment → success or failure → resource reallocation

Most experiments failing does not mean the system itself has failed. As long as failure can be identified, confirmed, stopped, and absorbed—and human resources, capital, and attention can be released—failure itself is part of the selection mechanism.

A healthy mechanism of future generation must both allow conjectures about the future to be born and allow incorrect conjectures to die.

Zombie State: a degenerative state after loss of candidate eligibility

Zombie State—called “Zombie Proto-Bus” in earlier discussions—is not a normal subtype of Proto-Bus. It is a degenerative state in which a Proto-Bus has lost its Effective Death Condition, has failed for a prolonged period to complete the necessary validation, yet continues to consume resources, thereby losing its candidate eligibility.

Once a project enters Zombie State, it should be removed analytically from the normal set of Proto-Buses and marked separately. It may re-enter Proto-Bus status only after an Effective Death Condition has been re-established, a new falsifiable Core Hypothesis has been specified, and prior failure records have been retained in the Genealogy Ledger.

Proto-Bus → Death Condition failure / prolonged failure of necessary validation → Zombie

A typical Zombie process is: validation failure → Death Condition is canceled, delayed, or bypassed → continued receipt of resources → failure again → support again; or validation failure → Core Hypothesis changes → re-registration → failure again → re-registration again.

The result is that failure cannot release resources, experimental resources remain locked for the long term, and other candidate futures are crowded out.

The damage caused by Soft Budget Constraints therefore does not occur only in already formed firms and Formal Buses. It also occurs earlier, in the Generation Domain: conjectures about the future that should

have ended continue to occupy resources that should have been redirected to other experiments.

A system may simultaneously display many projects, many funds, many “innovative firms,” and long average project lifetimes, yet produce few Formal Buses per unit of resources occupied for long periods. This structure can be described as: high experiment stock, low genuine generation rate.

On Modes of Bus Generation

New Buses can form in many ways—for example by discovering previously under-recognized demand, price differentials, or uses of resources; recombining existing technologies, resources, and organizational capabilities; or rewriting rights, responsibilities, and exchange boundaries. Rich theoretical traditions already exist around these mechanisms, and this section does not attempt to review the full history of innovation theory.

CBT pays particular attention to boundary-based generation because Boundaries are a first-order object in the definition of a Formal Bus. Some new Buses arise not first from new physical assets or technologies, but from redefining who may possess, use, benefit from, dispose of, and bear responsibility for something.

Assignable → exchangeable → capable of generating FCF → capitalizable

Boundary-based generation is more likely where frictions under old boundaries are high while an implementable window for a new boundary structure is opening. That window may arise from technological change, legal change, institutional opening, organizational innovation, or failure of an old institutional interface.

Entrepreneurial Function $\neq$ Positive Bus

The Entrepreneurial Function describes only how new structures are proposed and tested. It does not automatically imply that a new structure is positive for other actors or for the system as a whole.

A new Bus may generate mainly FCF_Produce or FCF_Exchange, but it may also depend mainly on FCF_Rent, FCF_Transfer, or even FCF_Plunder.

Generation capacity $\neq$ Positive Bus.

Once a new Bus has formed, analysis must return to the original CBT framework: where FCF comes from, where FCF goes, who shares the benefits, who bears the costs, how r is changed, whether Boundaries are stable, and how Multi-Agent EPV changes. The entrepreneurial mechanism is a descriptive interface for generation, not a moral evaluation.

6.5.6 Theoretical Boundary, SOP Interface, and Falsifiable Commitments

This section changes none of the Three Axioms, does not change the EPV formula, and adds no new component to r . It only supplies the logically prior interface missing from Section 6.1's definition of a Formal Bus: how an as-yet unformed future structure gradually acquires eligibility for Formal Bus analysis through real experimentation, validation, and clearing.

Unformed future → real experiment → Proto-Bus → validation and clearing → Bus → capitalization

V3.54 does not claim to have built a dynamic model of “how the future is fully endogenously generated.” The source of specific novelty still involves dispersed knowledge, subjective judgment, historical contingency, and creative processes that cannot yet be fully modeled.

What V3.54 adds is: the boundary between the Generation Domain and Capitalization Domain; the Accounting Asymmetry of Entrepreneurial Action; the admission rules for Proto-Bus; Structural and Declared Death Conditions; tiered validation signals; the Proto-Bus Genealogy Ledger; the Hard Budget selection mechanism; and Zombie State as a degenerative condition.

I. The Bus Analysis SOP Adds “Step 0: Domain Gate”

With this section incorporated into the main theory, the existing Bus Analysis SOP gains a preliminary judgment: before formally decomposing FCF and r , first determine whether the object of analysis lies in the Generation Domain, the Capitalization Domain, or a mixed transitional state.

If the object lies in the Generation Domain, prioritize the Proto-Bus, validation, Death Condition, and clearing rules in Section 6.5 rather than entering the steady-state EPV procedure directly. If the object has already formed a Formal Bus, proceed to the original Four-Step Bus Analysis. If an organization contains both mature Buses and multiple Proto-Buses, analyze them in layers; do not combine the FCF of mature operations with the unvalidated futures of candidate projects into one steady-state EPV.

II. Three Principal Falsifiable Commitments of This Section

Prediction 1: Independently Identified Soft-Budget Intensity Should Predict the Formation of Zombie State

The degree of Soft Budget Constraint must be identified using ex ante indicators independent of the outcome variable—for example the nature of the funding provider, guarantee structures, explicit or implicit bailout arrangements, historical rescue records, budget-continuation mechanisms, whether losses can be externalized, and whether funding automatically continues after failure. Whether the project later exits must not itself be used retrospectively to define the Soft Budget Constraint.

Under such independent identification, this section predicts that experimental ecologies with higher soft-budget intensity should, over the long run, exhibit a higher share of Zombie State, longer periods in which failed projects continue occupying resources, and more repeated resource flows toward projects that have not completed validation.

If, after controlling for major differences such as project type and technology cycle, independently identified soft-budget intensity shows no stable long-run relationship with these phenomena—or systematically shows the opposite relationship—the explanatory power of the proposition that “Hard Budgets act as a selector in generation” should be weakened.

Prediction 2: Different Validation Types Should Predict Different Future Outcomes

This section does not simply predict that “A-Class projects will necessarily be better than B/C-Class projects.” Its more specific differentiated prediction is: A-Class Stand-Alone Validation should mainly predict future independent commercial sustainability; B-Class Support-Backed Validation can predict technical feasibility, functional value, or genuine public demand, but should not automatically be extrapolated into stand-alone commercial sustainability after support is removed; C-Class Related-Party Validation should mainly demonstrate internal technology, process, and delivery capability, but should not automatically be extrapolated into independent market demand.

A further prediction is that if B-Class or C-Class validation is persistently misreported as A-Class Stand-Alone Validation, the withdrawal of support, related-party backing, or implicit guarantees should be more likely to produce systematic downward revisions in revenue, valuation, or financing capacity.

If different types of validation show no stable long-run differences in the outcomes they are supposed to predict, the validation-tiering framework in this section should be re-examined.

Prediction 3: Effective Death Conditions Should Improve Resource-Conversion Efficiency at the Ecosystem Level

This section does not use “there is a Death Condition, therefore projects exit faster” as its core prediction, because that is close to a definitional consequence. The more important empirical proposition is that, other things being similar, experimental ecologies with effective Structural or Declared Death Conditions—and in

which those conditions genuinely constrain continued resource commitment—should exhibit faster resource reallocation, a lower long-run share of Zombie State, and higher candidate-future resource-conversion efficiency.

Here, “resource-conversion efficiency” means the capacity to produce sustainable Formal Buses per unit of human resources, capital, and time committed over the long run.

If the existence and enforcement of Effective Death Conditions show no stable long-run relationship with these ecosystem-level outcomes, their theoretical status as a core discipline of Proto-Bus should be downgraded.

Closing of This Section

Once a mature Bus has formed, it is easy ex post to describe it as inevitable.

Before it formed, however, reality was rarely a roadmap with the probabilities already written in.

Someone saw a possibility, gave up part of what was already secure in the present, and committed time, capital, credit, or reputation to an action that might fail; reality then answered that conjecture through technology, customers, costs, competition, and losses.

Most conjectures disappear. A few begin to repeat. Repetition produces structure. Structure forms Boundaries. Boundaries carry cash flows. Only then does a possibility that previously could not be capitalized in an ordinary way truly become a Bus.

The entrepreneur converts a conjecture about a future that cannot yet be fully capitalized into an action that can be tested by reality.

Markets and institutions select which candidate futures can continue to exist; once a Formal Bus has formed, the capitalization system discounts its future returns back to the present.

V3.54 goes no further. Whether the full sequence “generation → capitalization → reflexivity → regeneration or destruction” should formally become CBT’s dynamic closed loop is a question about the theoretical identity of a later version and is not resolved in advance here.

Only when someone first bears a present that cannot be fully calculated can a future that later becomes calculable emerge.

Chapter 7 · Main Dynamic Chain: Time Preference → Interest Rate → Capitalization → Opportunity Cost

7.1 Time Preference and Interest Rates

Time preference governs the trade-off between “benefits now versus benefits in the future.”

In a world with money and credit, time preference is priced through the interest rate:

- Savers: give up current consumption and demand interest as compensation;
- Borrowers: are willing to pay interest in order to use future resources in advance.

In reality:

- The nominal interest rate is only one part of the r -structure;
- The true r is jointly determined by time preference, institutions, policy, geopolitics, and uncertainty.

Therefore, from the CBT perspective:

- Changes in interest rates reflect not only money supply and demand but also reassessments of future institutions and risks;
- Collective shifts in time preference are an underlying driver of many “turning points of an era.”

7.2 Capitalization: Bringing the Future into the Present

Once r exists, the future FCF sequence can be capitalized into EPV:

$$EPV = \sum_{t=1}^{+\infty} [FCF_t / (1 + r)^t]$$

Sharp changes in asset prices ultimately mean one of three things:

- Expected future FCF has changed;
- The r -structure has changed;
- Or both have changed at the same time.

Therefore:

- If FCF expectations are unchanged but r rises—for example because institutional risk increases or r_u rises—asset prices fall;
- If r is unchanged but expected FCF falls, asset prices also fall;
- When FCF is directed toward $FCF \rightarrow P$ and improves future capabilities, long-run EPV rises;
- If FCF is directed toward $FCF \rightarrow R$ / $FCF \rightarrow S$, EPV may instead deteriorate after a period of short-term prosperity.

7.3 Opportunity Cost: The Road Not Taken Is Also Priced

Every actor faces multiple potential Buses: career paths, investment projects, migration choices, institutional choices.

Opportunity cost is, in essence:

Under a given r -structure, opportunity cost is the difference in EPV between the path chosen and the paths that could have been chosen but were not.

Therefore:

- In an environment where r , r_u , and r_s are high, short-term arbitrage can appear more “rational”:
 - The future is distrusted, so long-term projects are worth very little after discounting;
 - The opportunity-cost calculation yields: “If I do not take it now, I am simply leaving money on the table.”
- In an environment with low r , credible institutions, and limited tail risk, long-horizon Positive Buses are easier to build:
 - The future is more predictable, and long-term investment has positive EPV;
 - The opportunity-cost calculation yields: “The short term is actually costing me long-term opportunities.”

CBT does not make a moral judgment in favor of “looking only to the present” or “looking only to the long term.” Instead, it:

Uses the structures of EPV and r to explain what kinds of behavior appear rational “from the actor’s point of view” under different environments, and then asks how institutions and incentives can change that rationality.

Chapter 8 · Multi-Agent EPV and Structural Fracture

8.1 Multi-Agent EPV Notation

Typical actors and their EPV are:

- EPV_C: consumers (Consumer);
- EPV_L: labor (Labor);
- EPV_M: firms / capital (Market / Firm);
- EPV_G: government (Government);
- EPV_Low: low-status / vulnerable groups (Low-status).

CBT asks how the EPV of these actors co-evolves under the same institutional structure and Bus network:

- Who is paying for whom?
- Who bears hidden costs?
- Whose EPV is systematically compressed or even liquidated?
- Which actors contribute positive FCF to the system, and which actors systematically extract FCF from it?

8.2 Structural Instability Criterion (Simplified)

In qualitative analysis, the following criterion can be used:

If, over the long run:

- $\Delta EPV_{\{M+G\}} > 0$ (the EPV of firms and government rises);
- $\Delta EPV_{\{L+Low\}} < 0$ (the EPV of labor and vulnerable groups falls);
- and there is no credible legal repair mechanism;

then the system will often also exhibit:

- $\Delta r_u > 0$ (the tail-risk premium rises);
- $\Delta r_s > 0$ (the social subjective discount rate rises, with more short-termism and cynicism);
- a widening Scissors Gap Δr (the time horizons of decision makers and society become increasingly misaligned).

The system enters a “boundary-rewriting risk zone.”

This criterion is not a precise equation but a structural signal:

- If growth is built on systematically depressing the EPV of labor and vulnerable groups,
 - the cost will sooner or later return in the form of a higher r_u and greater systemic risk;
 - Any actor that attempts to “optimize only its own EPV” while ignoring other actors will face structural backlash over the long run.
-

Chapter 9 · Crisis, Violence, and Boundary Rewriting

9.1 The Hard Condition for Crisis: Negative Buses Overwhelm the System

When, within a system:

- Negative Buses of various kinds—debt, rigid commitments, implicit guarantees, and so on—continue to accumulate;
- the ability of Positive Buses to create real FCF weakens or stagnates;

at some point the following condition appears:

Total FCF that can realistically be generated in the future

<

Sum of all priority claims made by Negative Buses.

At that point:

- The existing payment structure can no longer be maintained;
- The Bus network must be rearranged through default, write-downs, extensions, restructuring, shifting losses to others, or similar means.

Crisis is not a purely emotional event. It occurs when the hard constraint of the payment structure is reached.

9.2 EPV_{legal} and EPV_{violent}: Comparing Two Paths

Under pressure, groups compare the expected values of two broad paths:

- EPV_{legal}: the expected net present value of pursuing improvement through legal pathways within the existing institutional structure;
- EPV_{violent}: the expected net present value of rewriting Boundaries through violence, revolution, coups, and similar means.

When large numbers of actors feel that:

1. EPV_{legal} is persistently negative—no matter how hard they try, they see no hope;

2. EPV_violent, despite enormous risk, has a subjectively expected value higher than EPV_legal;
3. r_u has already risen into the psychological zone of “everything is going to collapse anyway”;

the system is more likely to jump from a “logic of reform” to a “logic of Boundary Rewriting.”

9.3 The Bus Language of Violence and Revolution

In CBT language, violence and revolution can be expressed as:

- A discontinuous rewriting of the Third Axiom—Property Rights & Boundaries;
- A concentrated rewriting of the priority and validity of Negative Buses—whose debts are canceled, whose commitments are inherited, and whose rights are denied;
- A violent shock to and reset of the structures of r_u and r_s .

In other words:

Violence and revolution are not emotions that “appear from nowhere.” Under particular FCF structures, r -structures, and Δr structures, they are an extreme form of Boundary Rewriting that can emerge after prolonged divergence in Multi-Agent EPV.

Chapter 10 · No-Discount Zones: Bottom Lines and System Robustness

10.1 Definition

No-Discount Zone:

A bottom-line domain that an actor deliberately treats as non-tradable and not subject to monetary discounting.

Examples:

- Individuals: the life and health of family members, basic dignity, and bottom-line principles;
- Firms: product safety, core quality, basic commitments to employees, and brand trust;
- Nations: sovereignty, certain historical memories, and certain core values.

Such things cannot simply be treated as “something that can be sold at the right price.” Otherwise, the problem is not only ethical; it also becomes a source of long-run risk to FCF and the r -structure.

10.2 Economic Mechanism (Engineering Explanation)

A No-Discount Zone is not “anti-economic”; it is a choice about Boundaries. Its economic significance usually appears in the following ways:

1. It limits the scope for short-term arbitrage
 - It restrains high-risk, high-return gambling behavior;
 - It limits decisions that “sell off the entire future.”
2. It reduces long-run moral hazard and the probability of destructive behavior
 - Some actions are defined as “things we will not do at any price”;
 - This reduces the risk that institutions are hollowed out and trust is repeatedly consumed,
 - thereby lowering r_u .
3. It increases the credibility of institutions and contracts
 - When markets believe that “some commitments will be honored and some things will not be sold under any circumstances,”
 - trust in institutions rises and perceived $r_{\text{institution}}$ falls.
4. Over a longer horizon, it improves the quality of FCF that can be capitalized sustainably
 - Part of the short-term “sellable return” is sacrificed
 - in exchange for more stable long-run FCF and a lower r -structure.

Therefore:

A genuinely defended No-Discount Zone is an important support for the long-run robustness of a system. It is not “anti-market”; it sets a boundary the market may not cross.

Chapter 11 · The R-I-S-C Hierarchical State Map for Nations and Cities

This chapter introduces an “R-I-S-C Hierarchical State Map” for nations and cities to help interpret long-run development paths.

It is not a table of mandatory stages, but a state map that allows jumps, reversals, and prolonged lock-in.

11.1 The Four Layers: R, I, S, and C

1. R Layer (Resource Layer)

- Dominated by resource- and factor-based Buses: land, energy, minerals, demographic dividends, basic labor, and so on;
- FCF comes mainly from resource extraction, extensive use, and factor inputs;
- Typical forms: resource exports, primary products, and extensive processing attracted by low wages.

2. I Layer (Industrial Layer)

- Dominated by industrialization and mass-production Buses: manufacturing, infrastructure construction, and standardized large-scale production;
- R-layer factors are converted into scalable products and cash flows through equipment, processes, and organizational efficiency;

- Typical forms: large-scale factories, infrastructure-investment-led growth, and narratives centered on “capacity.”

3. S Layer (Service & Knowledge Layer)

- Dominated by Buses built on services, technology, brands, and organizational capabilities: finance, modern services, platform economies, R&D, intellectual property, and so on;
- The core sources of FCF are intangible assets and organizational capabilities;
- Typical forms: economic structures centered on technology, brands, network effects, and professional services.

4. C Layer (Credit / Constitution; Institutional & Credit Layer)

- Dominated by Buses based on institutions, credit, and rules: rule of law, contractual systems, financial systems, trust networks, sound governance structures, and so on;
- Provides R, I, and S layers with a sustainable capitalization environment through a stable structure and stable Boundary arrangements;
- Typical forms: a stable and credible legal order, a predictable policy environment, and a mature credit system.

In rough terms:

- R: wealth in raw materials and factors;
- I: the capability to transform materials into products;
- S: the capability to layer services, technology, and brands on top of products;
- C: the institutional and credit foundation that supports the long-run operation of the entire system.

11.2 Typical Paths, but Not Mandatory Ones

A “classic development path” for many nations or cities can be written as:

$R \rightarrow I \rightarrow S \rightarrow C$

But it must be emphasized: this is not a historically mandatory route, and certainly not a linear stage theory.

Reality contains many trajectories:

1. Repeated R-Layer Oscillation

- Resource boom $\rightarrow$ crisis $\rightarrow$ return to resource dependence;
- R-layer FCF is not capitalized into I / S / C, but dissipated through consumption, capital outflow, corruption, and similar channels.

2. Rapid Industrial Leap

- With the help of foreign capital and technology, a relatively weak R layer can be leveraged to build a much stronger I layer directly;

- If FCF continues to be capitalized into education, technology, and institutions, the system may move toward S and C;
- If FCF is used mainly for rent-seeking and short-term distribution, the system may remain “stuck in the I layer” for a long time.

3. Institution-First Path

- Major changes are made first at the C layer through institutional restructuring and credit-system construction;
- Lower $r_{\text{institution}}$ and more stable r_u then attract capital and talent, which in turn gradually reinforce R, I, and S.

4. Regression and Rupture

- War, coups, severe institutional collapse, and similar shocks can drive a system from higher layers back to lower ones:
 - For example, from a complex S / C service-and-credit economy back toward extensive R / I structures.

R-I-S-C should therefore be understood as a state map that permits jumps and reversals, not a one-way “development staircase.”

11.3 Intergenerational Capitalization of FCF: What Does “Evolution” Mean?

In CBT language, whether a nation or city “evolves” is not determined by whether it proceeds sequentially through $R \rightarrow I \rightarrow S \rightarrow C$. It depends on:

How much of each generation’s FCF is capitalized into the EPV of higher-quality Buses.

For example:

- During a resource boom at the R layer, large amounts of FCF may be generated. If that FCF:
 - is used to build industrial infrastructure, education, technology, and institutions, more FCF is capitalized into the EPV of I / S / C layers;
 - is used for consumption, capital outflow, corruption, and short-term vote-buying, it remains at the R layer and flows heavily into $FCF \rightarrow S$, with little upward capitalization.

Likewise:

- During industrialization at the I layer, large amounts of FCF may be generated. If that FCF:
 - is used to improve product quality, brands, R&D, and organizational capability, the system gradually migrates toward the S layer;
 - is used for rent-seeking, monopoly, and excessive expansion, it may create a “concrete-and-steel trap,” remaining stuck at the I layer or even regressing.

The key to “evolution” is not completion of a linear path, but:

At each stage, directing more FCF toward Buses that improve system quality and freedom, rather than allowing Negative Buses, rent-seeking, and conspicuous consumption to absorb it.

11.4 Regression, Lock-In, and Being “Stuck in the Middle”

Common structural problems in the R-I-S-C State Map include:

1. R-Layer Lock-In

- Resource curse: large resource FCF is used to import consumer goods or distributed to a small number of vested-interest groups;
- Institutions do not encourage industrial and technological investment, while $r_{\text{institution}}$ and r_u remain high.

2. I-Layer Lock-In (One Structural Expression of the “Middle-Income Trap”)

- Industrialization succeeds, but:
 - FCF is directed toward real-estate financialization, rent-seeking, and short-term stimulus;
 - Investment in education, R&D, and institutional reform is insufficient;
- The result is long-term lock-in at the I layer, without formation of genuinely strong S / C layers.

3. A “Bloated” S Layer

- Finance and services expand excessively on top of weak institutional and credit foundations;
- FCF comes mainly from leverage, asset bubbles, and transfers rather than real production and innovation;
- Once r_u rises or $r_{\text{institution}}$ is falsified by events, the S layer contracts sharply.

4. Failure or Hollowing-Out of the C Layer

- Institutions and credit are repeatedly damaged, pushing $r_{\text{institution}}$ and r_u upward layer by layer;
- Even where R / I / S potential remains, the system's capacity for capitalization falls sharply.

The R-I-S-C State Map makes it easier to discuss:

- At which layer is a nation or city currently concentrated?
- Is annual FCF being used for upward migration, dissipated in place, or even pulling the system backward?
- Which policies, institutions, or external shocks could cause the trajectory to “jump layers,” reverse, or even fall sharply?

11.5 Operational Template for Analyzing a Nation / City (Concise Version)

In practical analysis, national / urban hierarchical-state analysis can be organized around the following simple template:

1. Determine the layer in which the main Buses currently sit (R / I / S / C);

2. Analyze the FCF Source Structure (FCF_Produce / FCF_Exchange / FCF_Rent / FCF_Transfer / FCF_Plunder);
 3. Analyze the FCF Use Structure (by default $FCF \rightarrow P$ / $FCF \rightarrow R$ / $FCF \rightarrow S$; where retention, debt service, reserves, or financial buffers need to be made explicit, separate out $FCF \rightarrow B$), together with the share invested in next-layer Buses;
 4. Analyze whether the r-structure—especially $r_{institution}$, r_u , and r_s —supports upward migration;
 5. Assess whether the system is “moving upward gradually,” “stuck in the middle,” “circling in place,” or “on a regressive trajectory.”
-

11.6 The Theoretical Status of R-I-S-C: A State-Classification Map, Not a Law of Evolution

The theoretical identity of R-I-S-C must be stated explicitly to avoid two misreadings. (Beginning with this version, the formal name is changed from “Bus Evolution Chain” to “R-I-S-C Hierarchical State Map” to avoid stage-theory interpretations; “evolution chain” may remain as a historical nickname in informal speech.)

The first misreading is to treat it as a stage theory. As repeatedly stated above, it is not a mandatory route.

The second misreading is more subtle: treating it as a completed theory of evolution. More precisely, CBT can currently provide a list of necessary conditions for layer transitions, not a theory of sufficient conditions.

Necessary conditions for upward transition (difficult to achieve if any is absent):

- 1) A sufficient share of FCF generated at the preceding layer flows into $FCF \rightarrow P$ and is invested in capabilities required by the next layer;
- 2) $r_{institution}$ and r_u are low enough that long-horizon investment is rational in the present;
- 3) Organizational and human-capital structures capable of absorbing the new layer are present;
- 4) The time window required for transition is not interrupted by external shocks.

Typical triggers of regression:

- 1) C-layer credit is repeatedly falsified by events (Boundaries are rewritten arbitrarily and commitments fail systematically);
- 2) FCF on the main Positive Buses breaks down without substitutes;
- 3) External shocks such as war or sanctions directly destroy the networks on which higher-layer Buses depend.

Yet satisfying the necessary conditions does not guarantee a transition. When and how transition occurs involves entrepreneurial discovery, technological opportunities, and historical contingency, which remain beyond the current explanatory capacity of this framework.

The correct use of R-I-S-C is therefore as a classification map for state diagnosis and risk localization—where the system is now, where it may become stuck, and what could cause it to fall—not as a predictor of development paths that claims to know where it must go next.

Acknowledging this boundary does not weaken the framework. It prevents the framework from being extended beyond what it can support.

Chapter 12 · Capability Bus and Happiness Bus (Extended Tools)

12.1 Capability Bus

Intuitive definition:

The Capability Bus is a route describing how an individual's capabilities evolve over time and how they affect FCF and r_{psy} .

At time t , let the individual's capability state be represented by a vector:

$$A(t) = [a_1(t), a_2(t), \dots, a_n(t)]$$

Each component $a_i(t)$ represents one capability, such as professional skills, cognitive ability, health status, social capital, psychological resilience, and so on.

For each capability dimension i , we can write an evolution relation:

$$a_i(t + 1) = a_i(t) + g_i(\text{Invest}_i(t), \text{Context}(t))$$

where:

- $\text{Invest}_i(t)$: investment in capability i at time t (time, money, attention, and so on);
- $\text{Context}(t)$: the external environment (industry, institutions, technological change, and so on);
- g_i : a function that converts investment and environment into changes in capability.

Capability state $A(t)$ affects:

1. The capability to create future FCF:

$$\text{FCF}_{\text{future}}(t) = F(A(t), \text{Opportunities}(t), \text{Boundaries}(t))$$

2. The individual psychological discount rate $r_{\text{psy}}(t)$:

- The stronger the capabilities, the greater the sense of security and the larger the option set; r_{psy} will generally be lower, making long-term planning and investment more attractive;
- When capabilities are continuously weakened, r_{psy} rises and the individual becomes more inclined toward short-term decisions.

Therefore, the essence of “investing in oneself” can be expressed as:

Given external Boundaries and the opportunity structure,
adjust $Invest_i(t)$, optimize the evolution path of $A(t)$,
and thereby improve future FCF and r_{psy} .

12.2 Happiness Bus (Summary)

The Happiness Bus focuses on how an actor allocates time and attention among dimensions that cannot be fully monetized once basic material needs have been met.

Intuitively, the Happiness Bus is related to variables such as:

- Quality of relationships: intimate relationships, friendship, community;
- Sense of self-realization: achievement and meaning;
- Autonomy and sense of control;
- Mental health.

It has complex feedback relationships with FCF, r_{psy} , and No-Discount Zones:

- If the Happiness Bus is excessively sacrificed in pursuit of short-term FCF, r_{psy} often rises through anxiety and burnout, which in turn damages long-run FCF;
- If the Happiness Bus is reasonably protected, it can instead lower r_{psy} and stabilize r_s , making long-horizon planning feasible.

CBT does not attempt to reduce “happiness” to a simple formula. Instead, it offers a perspective:

Treat happiness as a route that runs in parallel with the wealth Bus and interacts with it, adding the dimension of “how people are actually living” on top of FCF and EPV analysis.

Chapter 13 · Analysis SOP: Domain Determination + Four-Step Bus Analysis

This chapter applies to structural analysis of individuals, firms, cities, and nations. Before entering the Four-Step Bus Analysis, it adds “Step 0: Domain Gate” to distinguish the Generation Domain from the Capitalization Domain.

13.0 Step 0: Domain Gate

Before formally decomposing FCF and r , first determine whether the object of analysis lies in the Generation Domain, the Capitalization Domain, or a mixed transitional state.

Generation-Domain object: prioritize the Proto-Bus, validation, Death Condition, and clearing rules in Section 6.5; do not enter the steady-state EPV procedure directly.

Capitalization-Domain object: proceed to the Four-Step Bus Analysis below.

Mixed object: if an organization contains both mature Buses and multiple Proto-Buses, analyze them separately by layer. Do not combine the FCF of mature operations with the unvalidated future of candidate projects into one steady-state EPV.

13.1 Step 1: Define the Actor and Boundaries

- Specify the object of analysis (individual / firm / city / nation);
- Map its balance sheet and its Boundaries of rights and obligations:
 - What rights does it hold (possession, use, benefit, disposal)?
 - What obligations does it bear (taxes, debt, liability, political commitments)?
 - What can it do and not do (institutional, geographic, technological, and other constraints)?

13.2 Step 2: Decompose FCF (Sources + Uses)

1. Decompose sources

- Which of FCF_Produce / FCF_Exchange / FCF_Rent / FCF_Transfer / FCF_Plunder currently account for most FCF?
- What is the structural balance between “productive creation” and “plunder and extraction”?
- Does the system rely on “high-quality, creation-based FCF,” or primarily on “plunder / transfer-based FCF”?

2. Decompose uses

- Where is current FCF mainly directed: $FCF \rightarrow P$ / $FCF \rightarrow R$ / $FCF \rightarrow S$?
- Is $FCF \rightarrow P$ being persistently crowded out by $FCF \rightarrow R$ and $FCF \rightarrow S$?
- How much FCF flows to the next generation and next-layer Buses (education, R&D, institutional construction)?

3. Preliminary judgment

- Does the current system exhibit a “high-quality FCF” structure or an “unsustainable FCF” structure?

13.3 Step 3: Decompose r (Discount-Rate Structure + Scissors Gap)

1. Decompose the components of r

- r_0 : time preference;
- r_{policy} : policy environment;
- $r_{\text{institution}}$: institutions and rule of law;
- r_{geo} : geopolitical risk;
- r_u : tail risk;
- r_s : Social Subjective Discount Rate;
- At the individual level, pay attention to r_{psy} .

2. For systems with a decision center

- Identify r_{decision} (r_g at the national level);
- Calculate or assess the Scissors Gap $\Delta r = r_{\text{social}} - r_{\text{decision}}$ (at the national level, $\Delta r = r_s - r_g$).

3. Observe

- Is Δr excessively large—whether because the top is long-term while the bottom is short-term, or because the top is short-term while the bottom is long-term?
- Is r_u rising (stronger perception of tail risk)?
- Is r_s rising (society becoming more short-term)?
- Are policy and institutional changes narrowing or widening these differences?

13.4 Step 4: Map the Bus Network and Endgames

1. Bus-network structure

- What are the number and scale of Positive Buses and Negative Buses?
- Which key Positive Buses support the system?
- Which large Negative Buses are continuously crowding out future FCF?

2. Multi-Agent EPV and structural stability

- What are the directions of EPV_C / EPV_L / EPV_M / EPV_G / EPV_{Low} ?
- Is there a structural fracture in which EPV_M+G rises while $EPV_L+\text{Low}$ falls?
- Does a credible legal repair path exist?

3. Convergence or divergence of Δr

- Is the Scissors Gap Δr shrinking—indicating convergence between the time preferences of the decision center and society—or widening?
- If Δr diverges for a prolonged period, is there a plausible path for EPV_{legal} to turn positive, or does EPV_{violent} increasingly appear larger in actors' subjective perception?

4. Possible endgames

- Chronic erosion: Negative Buses do not explode, but they suppress $FCF \rightarrow P$ and innovation capacity over the long run;
- Sudden crisis: at some point, the payment structure and r -structure are forced to reset;
- Gradual reform: relatively smooth Bus restructuring through adjustments to FCF structure, r -structure, and Boundary arrangements;
- Violent Boundary Rewriting: property rights and Boundaries are rearranged through extreme means, resetting large amounts of EPV.

5. Paths of improvement and adjustable levers

- FCF structure: encourage $FCF_{\text{Produce}} + FCF \rightarrow P$; restrain $FCF_{\text{Rent}} / FCF_{\text{Plunder}}$ and excessive $FCF \rightarrow R / FCF \rightarrow S$;

- r-structure: lower r_institution, r_u, and r_s; stabilize r_policy;
 - Δr: use institutional design, communication mechanisms, and incentive arrangements to narrow the time-preference gap between the decision center and society;
 - Boundaries: when necessary, rewrite Boundaries and adjust the structure of Negative Buses, but do so through institutionalized and gradual pathways whenever possible.
-

13.5 Output Requirement: Prospective Observation Point

Beyond the Four Steps, this version adds a mandatory deliverable: every completed analysis must end with at least one testable Prospective Observation Point in the following format:

If this diagnosis is correct, then within the next [time window], we should observe [specific change X]. If instead [non-X or an opposite change] is observed, then [which link in the diagnosis] must be revised.

Four requirements:

- 1) The observation point must be a logical consequence of the diagnosis, not a generic trend forecast;
- 2) The time window must be explicit (quarter / year / maturity date);
- 3) It must state in advance "what observation would overturn this judgment," not only "what would confirm it";
- 4) Observation points and review records should be archived as a long-run sample of the analyst's own judgment quality.

The logic of this requirement is straightforward: without a Prospective Observation Point, even a perfectly self-consistent analysis is only an ex post explanation. CBT's commitment to falsifiability must be implemented in the output format of every concrete analysis, not left at the level of theoretical declaration.

Chapter 14 · Methodological Appendix: Linearity, Nonlinearity, and Simplification

14.1 On Linear Addition

CBT uses the following linear additive notation:

$$r = r_0 + r_{\text{policy}} + r_{\text{institution}} + r_{\text{geo}} + r_u + r_s$$

This notation is adopted for explanatory clarity. In reality, the components interact and exhibit nonlinearity:

- r_policy and r_institution can affect each other;
- changes in r_geo can both raise r_u and alter r_s;
- the effects of some variables are better represented through multiplicative or threshold functions.

CBT therefore adopts the following approach:

- At the framework level, it uses a “linear decomposition + nonlinear criteria” approach;
- In concrete analysis, nonlinearity is represented through scenarios, comparative cases, and “high / medium / low” ranges rather than through complex equations everywhere.

14.2 On the R-I-S-C Hierarchical State Map

The R-I-S-C Hierarchical State Map describes the long-run structural states of nations and cities. It must be emphasized:

- It is a multi-state map, not a one-way linear stage theory;
- real-world paths may jump, reverse, or remain stuck at one layer for long periods;
- CBT asks whether each generation’s FCF is capitalized into higher-quality Buses, not whether the system has “completed” some predetermined stage.

14.3 On Formalizing the Capability Bus

The Capability Bus uses the relation:

$$a_i(t + 1) = a_i(t) + g_i(\text{Invest}_i(t), \text{Context}(t))$$

This relation serves as a structural illustration rather than a universal differential equation.

The specific form of g_i must be modeled separately for different people and contexts:

- sometimes it resembles diminishing marginal returns;
- sometimes it contains pronounced thresholds (admission to a particular school, obtaining a certification);
- sometimes it becomes suddenly invalid or is amplified because of institutional or technological change.

CBT encourages readers to construct a context-specific g_i within this framework rather than trying to produce one “formula for everyone.”

14.4 On the Scissors Gap Δr

The Scissors Gap $\Delta r = r_{\text{social}} - r_{\text{decision}}$ is an alignment-gap indicator:

- It does not subdivide r into additional components; it compares differences in discount rates across actors;
- It reminds us that under the same institutional structure, “upper levels” and “lower levels” may live on entirely different time scales;
- In application, it is better described qualitatively in terms of “direction + magnitude” than estimated as a precise number.

14.5 On Prediction and Control

CBT aims to:

- provide a unified language and structured perspective;
- help identify structural strengths and structural risks;
- support scenario analysis and stress testing.

It is neither a “crystal ball” for precisely forecasting prices and turning points nor a universal controller in which “adjusting one parameter solves everything.”

When using CBT, the more important task is:

First clarify who, under what Boundaries, through which Buses, and at what r and Δr is extracting or building FCF; only then discuss strategy and choice.

14.6 Common Systematic Errors in Identifying Components of r

Because decomposing r depends on qualitative judgment by the analyst, the following five systematic errors should be checked whenever a component is assigned:

- 1) Reverse inference from the conclusion: starting with an overall impression that “the system is good or bad,” then assembling components to fit that impression. Self-check: is the evidence for each component independent of the overall impression?
- 2) Recency amplification: treating a recent event shock as a structural change and mistaking short-run fluctuation in r for its long-run level. Self-check: if the time window is extended to five or ten years, does the judgment still hold?
- 3) Viewpoint contamination: mixing the analyst's own political or emotional position into the estimate of r_s , the Social Subjective Discount Rate. Self-check: would a qualified analyst holding the opposite position accept this judgment about r_s ?
- 4) Double counting: entering the same risk source into multiple components—for example, an institutional crisis raising $r_{\text{institution}}$, r_u , and r_s simultaneously—thereby systematically overstating total r . Self-check: each risk source should be assigned only one primary landing point.
- 5) Precision illusion: using a specific number (for example, “ $r_{\text{institution}}$ equals 4.2%”) to disguise the imprecision of a qualitative judgment. Discipline: unless supported by real market data, components should be expressed as “high / medium / low + direction.”

Chapter 15 · Symbol Quick Reference

- EPV: Economic Present Value
- FCF: Free Cash Flow
- $\text{FCF} \rightarrow P$ / $\text{FCF} \rightarrow R$ / $\text{FCF} \rightarrow S$: Production / Rent-Seeking / Show & Signaling Uses

$\text{FCF} \rightarrow B$: Balance-Sheet Use (retention, debt service, reserves, financial buffers)

- FCF sources: $\text{FCF}_{\text{Produce}}$ / $\text{FCF}_{\text{Exchange}}$ / FCF_{Rent} / $\text{FCF}_{\text{Transfer}}$ / $\text{FCF}_{\text{Plunder}}$

- r : overall discount rate
- r_0 : Base Rate of Time Preference (time-preference baseline)
- r_{policy} : policy and macro-environment component
- $r_{\text{institution}}$: institutional and rule-of-law component
- r_{geo} : geopolitical-risk component
- r_u : uncertainty premium (tail-risk component)
- r_s : Social Subjective Discount Rate
- r_{psy} : Individual Psychological Discount Rate
- r_{decision} : Decision-Center Discount Rate (often denoted r_g at the national level)
- Δr : Scissors Gap ($\Delta r = r_{\text{social}} - r_{\text{decision}}$; at the national level, $\Delta r = r_s - r_g$)
- Bus_i : the i -th Capitalization Bus
- $\text{EPV}_C / \text{EPV}_L / \text{EPV}_M / \text{EPV}_G / \text{EPV}_{\text{Low}}$: EPV of consumers / labor / firm capital / government / lower-status groups
- $R / I / S / C$: Resource Layer / Industrial Layer / Service & Knowledge Layer / Credit / Constitution (Institutional & Credit Layer)
- $A(t)$: capability vector $[a_1(t), a_2(t), \dots, a_n(t)]$
- $\text{Invest}_i(t)$: investment in capability i
- $\text{Context}(t)$: external environment (institutions, technology, industry, and so on)

Generation Domain: the domain before a Formal Bus has formed, where the valuation object itself is still being generated

Capitalization Domain: the domain in which identifiable FCF, Holders, Boundaries, and an r -structure that can be meaningfully specified have formed

Proto-Bus: a candidate Bus that has entered a real experiment and is constrained by an Effective Death Condition, but has not yet met the criteria for a Formal Bus

D: Death Condition; in Declared form, $D = \{T, \text{Evidence}, \text{Exit Rule}\}$

Structural D: a Structural Death Condition formed by real budget constraints such as cash runway, financing constraints, debt service, bankruptcy, and market exit

Declared D: a Declared Death Condition that substitutes for weakened Structural D through an ex ante horizon, evidence threshold, and Exit Rule

A / B / C Validation: Stand-Alone Validation / Support-Backed Validation / Related-Party Validation; the three types of evidence are recorded separately and not merged into a single validation total

Proto-Bus Genealogy Ledger: a ledger preserving the history of hypotheses, validation, Death Conditions, resource consumption, and re-registration

Zombie: a degenerative state after loss of candidate eligibility; the project has lost an Effective Death Condition or has failed to complete necessary validation for a prolonged period, yet continues to occupy resources

Domain Gate (Step 0): the gate before analysis that determines whether an object lies in the Generation Domain, the Capitalization Domain, or a mixed state

—— END OF MAIN TEXT ——

Appendix · Version Change Record (V3.52 → V3.54)

This revision follows the discipline of “patch gaps without expanding the theory”: no new conceptual system is added; only structural gaps are repaired. There are six changes:

- 1) Added Section 2.4: explicitly states the bridge argument between the axioms and the evaluative framework, acknowledges and defends CBT's minimum normative stance, and resolves the long-standing tension between “subjective axioms and objective evaluation”;
- 2) Added Section 3.4: makes the Hard Budget Constraint a formal precondition for EPV validity and an implication of the Property & Boundaries Axiom, closing the analytical loophole of “pseudo-capitalization” under soft constraints;
- 3) Added Section 3.5: treats reflexive environments as a third condition under which point-estimate EPV becomes invalid, provides diagnostic signals and handling rules, and grounds application-level judgments involving “false flows” in the main theory;
- 4) Added Section 11.6: clarifies the theoretical status of R-I-S-C as a state-classification map rather than a law of evolution, provides a list of necessary conditions for upward transition and triggers for regression, and explicitly acknowledges that a sufficient-conditions theory has not yet been established;
- 5) Added Section 13.5: adds a mandatory output requirement to the Analysis SOP—the Prospective Observation Point—so that falsifiability moves from a theoretical declaration into every concrete analysis;
- 6) Added Section 14.6: provides five common systematic errors in identifying components of *r* and corresponding self-check rules.

V3.53a Additions (Based on External Review Feedback; Three Corrections)

- a) Section 2.4 adds a scope limitation to the bridge argument: the claim that positive-sum structures are superior applies mainly to actors who still depend on a future and stable Boundaries; it does not apply to one-shot players who know they are near the end. This also yields a reverse diagnostic rule: when an actor shifts from production toward plunder, the shift often reveals its own judgment about its remaining time horizon;
- b) Section 3.4 weakens the inference from “is a real signal” to “is by default a real signal,” while adding an anti-whitewashing safeguard: stable support can be explicitly modeled as FCF_Transfer, but EPV under soft constraints must be reported separately as “Stand-Alone EPV + Support-Backed EPV.” The support-backed portion must separately assess withdrawal conditions and probabilities; reporting a single merged number is prohibited;
- c) Terminology is unified throughout the text: “R-I-S-C Bus Evolution Chain” is formally renamed “R-I-S-C Hierarchical State Map” (with synchronized changes in the Abstract, Chapter 11, and Section 14.2), consistent with the theoretical-status clarification in Section 11.6.

V3.54 Additions (Bus Generation Interface: Entrepreneurial Experiments and Candidate Futures)

- 1) Added Section 6.5: establishes the “Bus Generation Interface,” distinguishes the Generation Domain from the Capitalization Domain, and clarifies that the Generation Domain does not mean “r is very high,” but that r does not yet have a stable object to which it can attach;
- 2) Formally defines the Entrepreneurial Function and its “Accounting Asymmetry”: an observable sacrifice in the present is committed to a real experiment on a future that cannot yet be fully capitalized;
- 3) Introduces Proto-Bus and establishes four admission criteria: Real Resource Commitment, Core Hypothesis, External Validation Interface, and Effective Death Condition;
- 4) Divides Death Conditions into Structural D and Declared D, and identifies a key operational manifestation of a Soft Budget Constraint as the systematic dismantling of Structural Death Conditions;
- 5) Establishes the Core-Hypothesis Re-registration Rule and the Proto-Bus Genealogy Ledger to prevent pivoting, renaming, and metric rewriting from becoming tools of indefinite extension;
- 6) Establishes A/B/C validation tiering and uses the Functional-Demand Counterfactual Test to distinguish genuine public demand from rescue support;
- 7) Defines Zombie explicitly as a degenerative state after loss of Proto-Bus eligibility, and proposes three falsifiable predictions corresponding respectively to the ecosystem-level outcomes associated with Soft Budgets, validation types, and Death Conditions;
- 8) Adds Step 0, “Domain Gate,” to Chapter 13, prohibiting the FCF of mature Buses from being combined with the unvalidated futures of Proto-Buses into a single steady-state EPV; Section 6.5 also preserves an interface with the Reflexivity Boundary in Section 3.5 without constructing a complete dynamic closed loop in V3.54.

Future Research Agenda (as of V3.54)

Entrepreneurship and the future-generation mechanism: partially closed. V3.54 has established the Bus Generation Interface, including the distinction between the Generation and Capitalization Domains, the Entrepreneurial Function, Proto-Bus, Structural and Declared Death Conditions, validation tiering, the Genealogy Ledger, the Hard-Budget selection mechanism, and the Zombie degenerative state. However, “how specific novelty itself is generated” remains unmodeled, and this version explicitly does not construct a complete equation of future generation.

Dynamic model of reflexivity: still open. V3.53a established the failure boundary for point-estimate EPV in strongly reflexive environments; V3.54 additionally identifies an interface through which Proto-Bus financing prices feed back into available resources, but a unified dynamic closed loop has not yet been built.

Dialogue with theoretical lineages: ongoing. Future work should position CBT more precisely relative to North, Williamson, Mises, Hayek, Kirzner, Schumpeter, Nelson-Winter, Alvarez-Barney, Taleb, and related traditions, clarifying what CBT inherits, translates, combines, and newly connects. The formal interface between Capitalization Participation Rate $\theta(t)$ and the main theory also remains to be completed.

Acknowledgments

Capitalization Bus Theory was not written in a single pass. It has gradually developed into a working theory through sustained reading, business practice, case analysis, repeated discussion, and multiple rounds of adversarial review. Beginning with value investing and discounted present value, it has continuously absorbed ideas from the Austrian School, institutional economics, transaction-cost theory, entrepreneurship theory, evolutionary economics, and work on risk and antifragility, while attempting to translate these dispersed bodies of knowledge into a unified coordinate system of FCF, r , Boundaries, and Buses.

I am grateful to everyone who contributed questions through discussion, criticism, and real-world cases. Many of the moments that genuinely moved the theory forward came not from “finding an elegant answer,” but from discovering a counterexample that an existing formulation could not accommodate, a gap in a conceptual boundary, or a point at which the theory had to allow itself to be falsified. The Bus Generation Interface added in V3.54 was shaped in exactly this way, gradually moving from a sketch to a formal set of provisions through repeated examination.

Multiple large-language-model tools were used in writing, structuring, constructing counterarguments, comparing versions, and editing language. At different stages, these tools served as aids for thought experiments, conceptual translation, red-team review, and text editing. Artificial intelligence is treated here as a research tool and dialogue partner, not as the bearer of theoretical responsibility. All choices among core concepts, final judgments, version decisions, and any resulting errors remain the responsibility of the author.

Special thanks go to the criticism that repeatedly forced this theory to maintain the discipline of “patch gaps without expanding.” A theory that cannot allow erroneous concepts to die will eventually be dragged down by the illusion of its own explanatory power, just like a project without a Hard Budget Constraint. May CBT retain this capacity for self-correction: allowing new futures to enter, and allowing judgments that no longer hold to exit.

References

Note: the following works identify the principal theoretical lineages and methodological sources of CBT. CBT's relationship to these traditions includes inheritance, translation, combination, and re-expression; this does not imply that every concept in the main text is derived directly from a single source. Future versions will continue to position CBT, item by item, relative to existing theories.

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