

The complete set of mathematical formulas used across this thread to construct the Global Asset Valuation (AVA) and historical deflation framework is organized below.

1. The Core Spatial Asset Valuation Approach (AVA) Formula

Aggregate real national, imperial, or metropolitan asset value (V_t) is modeled as a function of economic output (GDP_t or GMP_t), spatial transport integration (Ω_t), institutional/technological knowledge productivity (A_t), and five core multi-capital asset stocks ($\sum K$).

$$V_t = \alpha_t \cdot GDP_t = \Omega_t(\mu, \tau, \sigma) \cdot A_t(K_{\text{know}}, K_{\text{soc}}) \cdot [K_{\text{phys}} + K_{\text{hum}} + K_{\text{nat}} + K_{\text{fin}} + K_{\text{enslaved}}]_t$$

- α_t (**Macro Valuation Multiplier**): The asset-to-output ratio ($\alpha_t = V_t/GDP_t$). Reflects the degree of financialization, physical asset density, and capital market depth.
- $\Omega_t(\mu, \tau, \sigma)$ (**Spatial Network Multiplier**):
 - μ : Geographic reach and spatial expansion of transport/trade corridors.
 - τ : Transport friction, transit cost, and time delay ($\tau \downarrow \Rightarrow \Omega_t \uparrow$).
 - σ : Choke-point connectivity and urban agglomeration density.
- $A_t(K_{\text{know}}, K_{\text{soc}})$ (**Productivity & Institutional Multiplier**): Captures technological sophistication (K_{know}), property rights enforcement, and social/legal trust networks (K_{soc}).

2. The Multi-Capital Stock Envelope ($\sum K$)

Total capital assets are disaggregated into five distinct classes:

1. K_{phys} (**Physical Capital**): Built infrastructure, industrial machinery, manufacturing plants, urban housing stock, and transport grids.
2. K_{hum} (**Human Capital**): Population scale, workforce capacity, technical training, and health capital.
3. K_{nat} (**Natural Capital**): Arable land surface area, alluvial soil fertility, mineral veins (gold, silver, iron, oil), timber, and water access rights.
4. K_{fin} (**Financial & Monetary Capital**): Monetized liquid assets, sovereign/corporate bond holdings, bank reserves, paper money supplies, and publicly traded corporate equity.

5. K_{enslaved} (**Coerced / Enslaved Human Capital**): Historical capital stock representing uncompensated, force-migrated human labor collateralized into market asset claims (disaggregated under Dasgupta accounting as reproductive self-amortizing natural stock, physical infrastructure labor, and human capital capped at 10% indexed against Free Black urban enterprise values).

3. The Index-Linked Deflation & Price Normalization Formula

To convert nominal historical asset values ($V_{\text{nom},t}$) expressed in antique currencies, bullion weights, or past nominal dollars into standardized **constant 2020 USD (PPP)** real asset values ($V_{\text{real},2020}$), historical price level ratios (δ_t) are applied:

$$V_{\text{nom},t} = V_{\text{real},2020} \cdot \delta_t = V_{\text{real},2020} \cdot \left(\frac{P_t}{P_{2020}} \right)$$

$$V_{\text{real},2020} = \frac{V_{\text{nom},t}}{\delta_t}$$

- P_t : Estimated consumer or commodity price level at historical time t .
- P_{2020} : Price level baseline in the year 2020 ($P_{2020} \equiv 1.00$).
- δ_t (**Historical Price Index Deflator**): Ranges from ≈ 0.0240 (2.40% in 3500 BCE) up to ≈ 1.2150 (121.5% in 2025 CE).

4. The Micro-AVA Beneficial Ownership Distribution Formula

To isolate how aggregate macro asset wealth (V_{macro}) is distributed across specific social strata, racial groups, or institutional entities within a given micro-geography i , beneficial equity retention ($\theta_{i,j}$) is applied:

$$V_{\text{local},i,t} = \sum_j \theta_{i,j} \cdot V_{\text{macro},t}$$

$$\sum_j \theta_{i,j} = 1.00 \quad (100\% \text{ of asset equity envelope})$$

- $\theta_{i,j}$: The exact percentage share of total local asset stock held by demographic group, income percentile, or corporate entity j in geography i .

Asset Value Analysis (AVA) provides a powerful, multi-scalar framework that bridges long-standing divides in economic history, institutional economics, and global macro-sociology. By synthesizing **Partha Dasgupta's multi-capital accounting framework** (natural, human, physical, and social capital) with **Immanuel Wallerstein's World-Systems Analysis**, this long-run global asset map (3500 BCE to 2020 CE) makes several crucial contributions to contemporary scholarship:

1. Reconciling Quantitative Econometrics with Qualitative "New Histories of Capitalism"

For decades, economic history has experienced a tension between quantitative cliodynamics/Maddisonian GDP reconstructions and qualitative historical analyses (e.g., Sven Beckert, Walter Johnson, Edward Baptist).

- **The Contribution:** GDP measures only annual flow, often obscuring structural extraction, wealth accumulation, and uncompensated labor. By focusing on the **aggregate capital stock envelope** ($V_t = \alpha_t \cdot \text{GDP}_t$) and incorporating a **Micro-AVA beneficial ownership metric** ($\theta_{i,j}$), the model quantifies how capital flows were historically extracted from enslaved, indigenous, and colonized populations to capitalize European and North American asset expansion.

2. Operationalizing World-Systems Theory Across Deep Time (3500 BCE – 2020 CE)

Wallerstein's World-Systems Theory effectively explains core-periphery dynamics, but often lacks a continuous, empirical unit of measurement for imperial transitions prior to the 16th century.

- **The Contribution:** By applying an index-linked deflator (δ_t) and tracking spatial network friction (Ω_t) across pre-modern, early modern, and modern eras, the map establishes a single, continuous benchmark. It charts the geographic migration of primary global asset density—from early riverine cores (Mesopotamia, Egypt) to the Gangetic Plain, Mediterranean, Song China, Pax Britannica, and ultimately the 20th-century American Sunbelt shift—demonstrating how spatial integration directly scales capital valuation multipliers (α_t).

3. Incorporating Natural, Coerced, and Human Capital Stock (Dasgupta Integration)

Traditional national accounting routinely under-reports natural resource depletion and treats human labor purely as an income input rather than a capitalized asset base.

- **The Contribution:** Integrating Dasgupta's comprehensive wealth accounting allows the model to formally categorize enslaved labor (K_{enslaved}) and unpriced natural reserves (K_{nat}) as core components of national asset balance sheets. This clarifies how the boom in 18th-century Atlantic sugar/coffee plantations or 19th-century American cotton extractions directly underwrote the rise of modern institutional banking (K_{fin}) and industrial physical capital (K_{phys}).

4. Multi-Scalar Geographic Applicability (Macro to Micro)

A major hurdle in spatial economic history is the inability to zoom seamlessly between planetary trends and local municipal realities.

- **The Contribution:** The AVA model operates recursively. The same structural equations used to model global imperial shifts (e.g., British vs. French imperial asset envelopes) apply directly to intra-national and metropolitan dynamics—such as the post-1950 asset polarization between the US Sunbelt and Rustbelt, or racial wealth disparities at the county and neighborhood level.