

# ON THE NECESSITY OF COMPLEX NUMBERS IN THE THEORY OF LUXURY PRICING: A SPECTRAL APPROACH TO “PRICE ON DEMAND”

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ABSTRACT. We prove that the classical real-valued theory of pricing is insufficient to describe the behavior of luxury goods, and that any consistent model must be defined over the complex field  $\mathbb{C}$ . We introduce the *Veblen residue* and demonstrate that the empirically observed phrase “*Price on Demand*” corresponds precisely to a pole of order one located at the point at infinity on the Riemann sphere of desire. As an application, we derive a closed-form expression for the rate of wallet divergence and establish the Fundamental Theorem of Luxury (Theorem 6.1), which states that every non-constant luxury price has at least one root in the consumer’s solvency. We conclude with a discussion of the Snob–Riemann hypothesis, whose non-trivial zeros are conjectured to lie entirely on the critical line  $\operatorname{Re}(P) = 0$ .

## 1. INTRODUCTION

Consider the following empirical datum, reported to the authors during an informal field study conducted in the summer of 2026. A consumer, browsing the online catalogue of a distinguished Parisian *maison*, encountered a diamond tiara. Where a price was expected, the catalogue displayed instead the enigmatic string

$$\text{Price}(\text{tiara}) = \text{``Price on Demand''}.$$

The consumer, possessed of an otherwise sound understanding of the real number line, reported acute cognitive distress. This paper is an attempt to relieve that distress, not through therapy, but through mathematics.<sup>1</sup>

The central thesis of this work is simple to state and expensive to verify:

*The price of a luxury good is not a real number.*

Classical microeconomics assumes  $\text{Price: Goods} \rightarrow \mathbb{R}_{\geq 0}$ . We shall demonstrate that this assumption, while adequate for potatoes, collapses catastrophically in the neighborhood of Place Vendôme. The correct codomain is the complex field  $\mathbb{C}$ , and the imaginary component is not a modeling artifact but the very substance of the good being sold.

**1.1. Prior work.** The foundational text remains Veblen’s *Theory of the Leisure Class* [1], which introduced the notion that demand can *increase* with price—a phenomenon so offensive to real analysis that its resolution has awaited the present paper. Subsequent contributions [2, 3] established the sociological scaffolding but declined, for reasons of disciplinary cowardice, to write down a single differential equation.

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<sup>1</sup>The two are, in the authors’ experience, rarely distinguishable.

## 2. THE COMPLEX PRICING FIELD

**Definition 2.1** (Complex price). Let  $g$  be a good. Its *complex price* is the quantity

$$P(g) = a + bi \in \mathbb{C},$$

where  $a = \operatorname{Re}(P) \geq 0$  denotes the *material component* (raw materials, labor-hours, karats of diamond) and  $b = \operatorname{Im}(P) \geq 0$  denotes the *Veblen component* (brand equity, exclusivity rent, and the tax levied for the audacity of asking).

*Remark 2.2.* The reader is invited to note the etymological coincidence—which the authors regard as a theorem of natural language—that the *imaginary* part governs *vanity*, both sharing the semantic root of that which is insubstantial yet ruinously expensive.

**Axiom 2.3** (Potato axiom). A good  $g$  is called *ordinary* if  $\operatorname{Im}(P(g)) = 0$ . For ordinary goods, complex pricing reduces to the classical real theory, and the consumer experiences no distress. Potatoes are ordinary.

**Definition 2.4** (Luxury good). A good  $g$  is a *luxury good* if  $\operatorname{Im}(P(g)) > 0$ . It is a *high luxury good* if

$$\frac{\operatorname{Im}(P(g))}{\operatorname{Re}(P(g))} \gg 1,$$

i.e. if the price is overwhelmingly imaginary. Diamond tiaras are high luxury goods; indeed, the authors conjecture they are *essentially imaginary* (see Section 3).

**Proposition 2.5** (Perceived value functional). *The perceived value  $V$  experienced by a consumer is the modulus of the complex price:*

$$V(g) = |P(g)| = \sqrt{a^2 + b^2}.$$

*Consequently, a maison can inflate perceived value  $V$  without incurring any additional material cost  $a$ , simply by increasing the imaginary component  $b$ . This is the entire business model.*

*Proof.* Fix  $a$ . Then  $\partial V / \partial b = b / \sqrt{a^2 + b^2} > 0$  for  $b > 0$ . Marketing departments have known this since 1780; we merely supply the derivative.  $\square$

## 3. THE “PRICE ON DEMAND” PHENOMENON

We now arrive at the phenomenon that motivated this investigation.

**Definition 3.1** (Price-on-Demand operator). The *Price-on-Demand* state, denoted PoD, is the limiting configuration in which the material component vanishes relative to the Veblen component:

$$\text{PoD} := \lim_{a \rightarrow 0^+} (a + bi) = bi, \quad b \rightarrow \infty.$$

Equivalently, PoD is a *pure imaginary price of unbounded modulus*.

**Theorem 3.2** (Structure of “Price on Demand”). *The state PoD corresponds to a simple pole of the pricing function located at the north pole  $\infty$  of the Riemann sphere  $\hat{\mathbb{C}}$ . In particular, PoD does not lie in any finite neighborhood of the consumer’s budget, and no continuous path in  $\mathbb{R}_{\geq 0}$  reaches it.*

*Proof.* Consider the pricing function  $P(z) = 1/z$  where  $z$  parametrizes the consumer’s remaining solvency. As solvency  $z \rightarrow 0$  (the consumer approaches purchase),  $P(z) \rightarrow \infty$ . The map is holomorphic on  $\hat{\mathbb{C}} \setminus \{0\}$  and sends the origin to the point at infinity. Since “Price on Demand” is, by construction, the price you learn only *after* exhausting your solvency, it is realized precisely at  $z = 0$ , whence  $P = \infty$ . The pole is simple because the maison, mercifully, only ruins you once.  $\square$

**Corollary 3.3** (Screening interpretation). *The display of PoD functions as a topological screening mechanism: consumers who require a finite, real-valued price in order to make a purchasing decision are precisely those for whom  $z > 0$ , i.e. those with positive remaining solvency to protect. The maison’s target consumer satisfies  $z = 0$  a priori, having renounced the real axis entirely.*

*Remark 3.4* (Vernacular formulation). In field surveys, the state PoD was correctly, if informally, translated by subjects as: “If you have to ask, this price is not for you.” Theorem 3.2 provides the rigorous underpinning for this folk wisdom.

#### 4. WALLET DYNAMICS AND THE EULER CATASTROPHE

We model the consumer’s wallet  $\mathfrak{W}(t)$  as a function of exposure time  $t$  to the boutique environment.

**Theorem 4.1** (Euler catastrophe). *Let  $\beta = \text{Im}(P)$  denote the imaginary intensity (“snob factor”) of the ambient goods. Then the consumer’s wallet evolves according to*

$$e^{i\beta} + \mathfrak{W}(t) = 0,$$

whence, at the moment of maximal aesthetic conviction  $\beta = \pi$ ,

$$\mathfrak{W} = -e^{i\pi} = 1 \implies \mathfrak{W} \rightarrow -\infty \text{ under compounding vanity.}$$

*Proof.* This is Euler’s identity  $e^{i\pi} + 1 = 0$ , reinterpreted with the substitution  $1 \mapsto \mathfrak{W}$ , which is justified because at  $\beta = \pi$  the consumer’s entire net worth has become indistinguishable from unity (i.e. “just this one piece”). The divergence follows from repeated application, once per boutique visit.  $\square$

*Observation 4.2.* Theorem 4.1 explains the empirically documented phenomenon whereby a consumer enters a boutique intending to purchase “nothing” ( $\mathfrak{W}$  finite) and exits having purchased “just one thing” ( $\mathfrak{W} \rightarrow -\infty$ ). The transition is not gradual; it is the crossing of a branch cut.

#### 5. THE VEBLEN RESIDUE

We now develop the residue calculus of luxury.

**Definition 5.1** (Veblen residue). For a pricing function  $P$  with an isolated singularity at a good  $g_0$ , the *Veblen residue* is

$$\text{Veb}(P, g_0) = \frac{1}{2\pi i} \oint_{\gamma} P(z) dz,$$

where  $\gamma$  is a small counterclockwise contour around  $g_0$  in the space of goods (physically realized as the consumer circling the display case).

**Theorem 5.2** (Residue theorem for boutiques). *The total amount extracted from a consumer during a boutique visit equals  $2\pi i$  times the sum of the Veblen residues at each good encountered:*

$$\oint_{\partial(\text{boutique})} P(z) dz = 2\pi i \sum_k \text{Veb}(P, g_k).$$

*Proof.* Immediate from the classical residue theorem [4], once one observes that a boutique is a compact, positively-oriented, simply-connected region whose boundary the consumer traverses exactly once before being intercepted by a sales consultant. Goods with  $\text{Veb} = 0$  (the potatoes of Axiom 2.3) contribute nothing; the entire extraction is concentrated at the poles, i.e. the tiaras.  $\square$

**Corollary 5.3.** *A consumer who never fully encircles a display case ( $\gamma$  not closed) extracts no residue and escapes solvent. This is the mathematical content of the maternal instruction “don’t touch anything.”*

## 6. THE FUNDAMENTAL THEOREM OF LUXURY

**Theorem 6.1** (Fundamental Theorem of Luxury). *Every non-constant luxury price  $P \in \mathbb{C}[z]$  of degree  $n \geq 1$  has at least one root in the consumer’s solvency. That is, for every sufficiently expensive good there exists a consumer whose finances it exactly annihilates.*

*Proof.* By the Fundamental Theorem of Algebra,  $P$  has  $n$  roots in  $\mathbb{C}$ , counted with multiplicity. Since  $P$  is non-constant and luxury (hence unbounded in the imaginary direction), at least one root lies in the half-plane  $\operatorname{Re}(z) \leq \mathfrak{W}$ . That root is the consumer. The multiplicity of the root equals the number of monthly installments.  $\square$

**Corollary 6.2** (Existence of the ruined buyer). *For every tiara there exists at least one buyer. This is small comfort to the buyer, but constitutes an existence proof of considerable value to the maison.*

## 7. EMPIRICAL VALIDATION

We report field measurements collected from a representative Parisian catalogue. Prices are reported as  $(a, b)$  pairs where  $a$  is the estimated material floor (USD) and  $b$  the inferred Veblen component. The ratio  $\rho = b/a$  is the *snob quotient*.

Good	Material floor $a$	Veblen comp. $b$	Snob quotient $\rho$
Pearl head ornament	\$18,400	\$37,800	2.05
Laurel diamond tiara	\$21,200	\$50,550	2.38
Imperial diamond tiara	\$34,000	\$85,500	2.51
Signature “Torsade” tiara	\$40,000+	$\infty$ (PoD)	$\infty$
Potato (control)	\$0.42	\$0.00	0.00

TABLE 1. Complex decomposition of representative goods. Note the divergence of  $\rho$  precisely at the onset of the “Price on Demand” regime, consistent with Theorem 3.2. The potato serves as an ordinary-good control (Axiom 2.3).

*Observation 7.1.* The snob quotient  $\rho$  increases monotonically with material cost until, at the top of the range, it undergoes a discontinuity to  $+\infty$ . This is the empirical signature of the pole predicted in Section 3. We regard the potato control as decisive: no amount of experimental error can account for a snob quotient of exactly zero except the genuine absence of imaginary value.

## 8. THE SNOB–RIEMANN HYPOTHESIS

We close with the central open problem of the field.

**Conjecture 8.1** (Snob–Riemann Hypothesis). *Define the luxury zeta function*

$$\zeta_{\text{Snob}}(s) = \sum_{n=1}^{\infty} \frac{1}{(\text{price of the } n\text{-th most exclusive good})^s}.$$

*Then all non-trivial zeros of  $\zeta_{\text{Snob}}$  lie on the critical line  $\operatorname{Re}(P) = 0$ ; that is, every good of genuinely maximal exclusivity has zero material value and is purely imaginary.*

*Remark 8.2.* Conjecture 8.1 would imply, among other things, that the most exclusive object in existence costs nothing to make and everything to own—a proposition the authors find both mathematically elegant and morally suspect. A proof is not expected before the heat death of the leisure class.

## 9. CONCLUSION: THE THREE PILLARS OF LUXURY

We have shown that luxury pricing is irreducibly complex-valued (Definition 2.1), that “Price on Demand” is a pole at infinity (Theorem 3.2), that wallets diverge by an Euler catastrophe (Theorem 4.1), and that every tiara annihilates some buyer (Theorem 6.1). The entire edifice of this paper rests upon three results which, taken together, constitute what we shall call the *Three Pillars of Luxury*. We restate them here in their most quotable form, as the discipline will hereafter be built upon their foundation.

**Proposition 9.1** (First Pillar: the Linguistic Theorem). *The imaginary part of a price governs vanity, and this is no accident of notation but a theorem of natural language: the words imaginary and vain denote, respectively, the mathematical and the moral form of that which is insubstantial yet ruinously expensive. Formally, mathematics is here observed to be conducting an insult.*

*Proof.* By Remark 2.1 and the observation of Section 2,  $\text{Im}(P) = b$  measures precisely the non-material, non-utilitarian, purely reputational excess of a good. That this quantity is called *imaginary* in analysis and *vanity* in ethics, and that both terms share the semantic core of the insubstantial, cannot be coincidence. We conclude that the complex plane was, all along, editorializing.  $\square$

**Proposition 9.2** (Second Pillar: the Solvency Theorem). *Under sustained exposure to imaginary intensity  $\beta$ , the consumer’s savings tend to negative infinity:*

$$\mathfrak{W} \longrightarrow -\infty.$$

*Proof.* Immediate from the Euler catastrophe (Theorem 4.1), applied once per boutique visit and compounded over the consumer’s remaining lifetime. The limit is approached monotonically and, in the terminal phase, enthusiastically.  $\square$

**Proposition 9.3** (Third Pillar: the Central Thesis). *The founding empirical principle of this discipline may be stated in a single sentence, suitable for epigraphs, examination essays, and the defense of one’s own bank balance:*

*Some luxury pricing strategies rely on imaginary rather than real value.*

*Proof.* The Snob quotient  $\rho = b/a$  was shown empirically (Section 7) to diverge as goods approach maximal exclusivity, and to reach  $\infty$  precisely at the “Price on Demand” regime, where  $a \rightarrow 0$  and the price becomes *purely imaginary*. Hence in the limit the strategy relies on nothing real whatsoever. The thesis is not merely true; it is asymptotically the *only* thing that is true.  $\square$

*Remark 9.4* (Unification). The three pillars are not independent. Pillar 9.1 identifies the imaginary axis as the seat of vanity; Pillar 9.2 shows that residing there bankrupts you; and Pillar 9.3 concludes that the most refined luxury lives there *exclusively*. The logical arc is therefore: vanity is imaginary, the imaginary is expensive, and the expensive is entirely vanity. The reader will recognize this as a closed loop—which is fitting, since Theorem 5.2 taught us that closed loops are exactly where the money is extracted.

We close with a corollary of immediate practical import.

**Corollary 9.5** (Consumer defense). *A consumer wishing to remain solvent should restrict all transactions to the real axis  $\text{Im}(P) = 0$ , decline to close any contour  $\gamma$  around a display case (Theorem 5.2), and, upon encountering the state PoD, respond with the phrase:*

*“My wallet supports real arithmetic only; complex payment is not implemented.”*

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