WORKING PAPER

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CAPITAL EFFICIENCY INTELLIGENCE · WORKING PAPER · CEI-WP-05

The Mirror Ledger

A Deterministic, Evidence-Sealed Method for Provider-Side Recovery of Commercial-Payer Underpayment

We reframe commercial-payer underpayment as an information rent produced by a verification-cost asymmetry, show that a reconciled zero-balance account is an unexercised option rather than a settled account, and present a deterministic variance engine that inverts the asymmetry and seals every recovery to evidence.

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STANDARD: BOARD · INVESTMENT COMMITTEE · ERISA FIDUCIARY AUDIT · HARVARD MBA · MIT PHD COMPUTER SCIENCE

Dashboards show numbers. Kincaid IQ shows *receipts.*

ABSTRACT

Commercial-payer underpayment of healthcare providers is widely treated as an episodic billing error. We argue it is better understood as an **information rent**: a transfer produced by an asymmetry in the cost of verifying whether a remittance complies with the governing contract. Building on the economics of quality uncertainty (Akerlof), the economics of information (Stigler), and transaction-cost theory (Coase, Williamson), we show that a reconciled, zero-balance account is the rational equilibrium of costly verification rather than evidence of correct payment, and is formally an unexercised option the payer wrote. We present a deterministic method that inverts the asymmetry: a single variance engine reconstructs the contractually expected payment per claim line from a compiled, human-promoted contract and differences it against the remittance to produce **DREP** (Delta Reimbursed versus Expected Payment). Generative contract parsing is gated; deterministic computation is autonomous; every finding is sealed to an append-only, hash-chained evidence trail and labeled by confidence tier. We define a leakage taxonomy and its index (UWI), specify a twelve-product portfolio that rides a small set of compute cores, and translate recovered capital to enterprise value. The method is presented as a falsifiable, board-defensible instrument; dollar magnitudes for any given provider remain insufficient evidence until that provider claim and remittance files are ingested.

KEYWORDS revenue integrity · information asymmetry · deterministic computation · healthcare reimbursement · evidence provenance · capital efficiency intelligence

CONTRIBUTIONS

01 A reframing of underpayment as an information rent, and of the reconciled zero-balance account as an unexercised option the payer wrote and the provider never exercised.

02 A deterministic, evidence-sealed variance method (DREP) that separates gated generative parsing from autonomous reproducible computation.

03 A leakage taxonomy and a computed index (the Underpayment Waste Index) with a falsifiable detection surface mapped to constitutional primitives.

04 A twelve-product portfolio that demonstrates a build asymmetry: twelve falsifiable products riding roughly four to eight compute cores.

05 A capital-allocation translation from a recovered claim line to enterprise value, with an honest, tier-graded treatment of evidence.

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01 THE PROBLEM AND THE THESIS

Introduction

Healthcare cost is widely diagnosed as an analytics problem. We take a different view. On the provider side, it is a governance problem, an evidence problem, and a deterministic computation problem. The artifact at its center is a remittance that must be judged against a contract, and the difficulty is not that the comparison is conceptually hard but that, performed by hand, it is uneconomic at the scale required to matter.

A commercial payer and a provider sign a contract whose correct application requires interpreting fee schedules by code and place of service, modifier dependencies, multi-procedure logic, outlier thresholds, and grouper methodology. The payer adjudicates each claim against its own interpretation. The provider, to contest a single line, must reconstruct that interpretation. That reconstruction is expensive, and its cost is the lever on which the entire phenomenon turns.

This paper argues that underpayment is the price a provider pays for not being able to afford to check, and that lowering the price of checking reverses the rent.

We make the argument in two registers. The first is economic: we locate underpayment within the theory of information asymmetry and transaction cost, and we characterize the reconciled zero-balance account as a rational equilibrium rather than a clean account. The second is constructive: we specify a deterministic engine that inverts the verification-cost asymmetry and seals its findings to evidence, and we develop the product, value, and governance implications in full.

1.1 THE MIRROR LEDGER

The method is the plan-sponsor engine reflected across the ledger. Where the sponsor side reconstructs what a plan should have paid its pharmacy benefit manager and exposes the overpayment, the provider side reconstructs what a payer should have paid a provider and exposes the underpayment. The primitive is identical in both directions: a reconstructed expectation, an observed actual, and the signed difference between them, each difference bound to the contract term that governs it. Because the primitive is shared, the provider-side system inherits a tested engine and adds only the rule packs specific to payer remittance.

1.2 SCOPE AND STANDARD

We hold a single evidentiary standard throughout. No assertion outruns its evidence; every quantified claim is expressed as a formula or labeled by confidence tier; and a magnitude that requires data not in hand is named as insufficient evidence rather than estimated. This discipline is not stylistic. It is the property that makes the resulting instrument defensible to an audit committee and to a payer counterparty, and it is enforced mechanically by the architecture of Section 5.

1.3 STRUCTURE OF THE PAPER

Section 2 develops the economic object. Section 3 gives the anatomy of underpayment and its index. Section 4 establishes the contract as the only admissible standard. Section 5 specifies the system architecture. Section 6 defines the DREP method. Section 7 presents the product portfolio. Section 8 treats population-level intelligence. Section 9 translates recovery into capital. Section 10 addresses governance, risk, and boundaries. Section 11 describes deployment. Sections 12 and 13 discuss limitations and conclude.

UNDERPAYMENT AS AN INFORMATION RENT

02 The Economic Object

We begin from price theory rather than software. The defining feature of the payer-provider relationship is that one party adjudicates payment against an interpretation the other party cannot cheaply verify. This is the canonical setting of information asymmetry, and its consequences are well understood.

2.1 QUALITY UNCERTAINTY (AKERLOF)

Akerlof showed that when one party cannot cheaply verify the quality of what it receives, the market clears against the uninformed side. The lemons problem described used cars; the same structure governs remittance. The provider receives a remittance it cannot economically audit and is, on the margin, paid as if every adjustment were valid. The underpayment need not be fraud. It is the predictable equilibrium of asymmetric verification cost, and it persists precisely because each instance is too small to contest while the aggregate is material.

> Underpayment is not an error. It is an equilibrium produced by a verification-cost asymmetry. *Name the asymmetry and you can price it.*

2.2 THE ECONOMICS OF INFORMATION (STIGLER)

Stigler established that search and verification carry a price, and that the party able to drive the marginal cost of information toward zero captures the surplus that uncertainty had concealed. In the provider setting, the concealed surplus is the sum of small, individually immaterial underpayments distributed across thousands of lines. A manual appeal cannot be justified on any single line; the aggregate is large; the asymmetry survives on that arithmetic alone.

Deterministic computation collapses the marginal cost of verification. Once a contract is compiled to machine logic, reconstructing the expected payment for a line costs effectively nothing, and the comparison runs over the entire historical population in a single pass. The theory predicts the outcome: the rent that depended on costly verification returns to the party that earned the revenue.

WHY SAMPLING CANNOT SOLVE IT

A sample cannot detect a systematic underpayment that is small per line and large in aggregate, because the signal is, intentionally or structurally, invisible at the sample level. Only a deterministic pass over the full population resolves a signal engineered to hide in the small.

2.3 TRANSACTION COST (COASE, WILLIAMSON)

Coase and Williamson supply the corollary. The apparatus that interprets and adjudicates payment is a transaction cost, a tax levied on coordination and on the provider inability to observe. Contracts here are necessarily incomplete, and incomplete contracts under information asymmetry invite the opportunism Williamson modeled through governance and asset specificity. The discretionary clause, the ambiguous necessity trigger, and the retroactive offset right are the surfaces on which that opportunism operates. As observation cost collapses, the rent does not migrate; it returns.

2.4 THE ZERO-BALANCE ACCOUNT AS AN UNEXERCISED OPTION

A reconciled, zero-balance account is the purest artifact of this equilibrium. It does not mean the account was paid correctly. It means the provider rationally stopped searching, because the expected recovery from a manual audit fell below its cost. The account is closed in the ledger and open in fact. Formally, each such account is a standing option the payer wrote and the provider never exercised: the strike is the manual audit cost; the payoff is the recoverable underpayment; the option appeared out of the money line by line and was therefore left unexercised.

The most valuable accounts to re-examine are the ones everyone agreed were finished. Deterministic computation lowers the strike until exercising the option becomes rational across the whole population at once.

THE LEAKAGE TAXONOMY AND ITS INDEX

03 The Anatomy of Underpayment

Recoverable underpayment is not diffuse. It concentrates in a small number of vectors whose distribution is the standard heavy tail of forensic cost work: a minority of code and clause interactions drive the majority of recoverable dollars. We name the vectors, define their index, and treat each in turn.

UNDERPAYMENT WASTE INDEX (UWI)

$$UWI = (\Sigma \max(DREP_{line}, 0)) / (\Sigma ExpectedPayment_{line})$$

A computed population-level leakage rate, partitioned by vector and by confidence tier. Certified where the contract rate is explicit; modeled where the expected payment is inferred. It is the honest unit of opportunity for any provider.

The index is a rate, not a story. It is the figure that converts an abstract problem into a board-facing number once a provider files are ingested, and it decomposes cleanly into the six vectors below.

3.1 THE SIX LEAKAGE VECTORS

VECTOR	DEFINITION	TIER
Fee schedule	Lines reimbursed below the contracted rate, or against a stale schedule version.	Certified
Bundling	Multi-procedure encounters reimbursed below the sum the contract and coding rules require.	Certified
Downcoding	A lower-level code paid than was billed and documented.	Certified
Outlier	High-cost claims that crossed the contract outlier threshold without the add-on.	Certified
Grouper	Inpatient or outpatient grouping weights misapplied against the methodology.	Modeled
Offset	Historical overpayment offsets and retroactive adjustments applied to valid lines.	Modeled

3.2 FEE SCHEDULE, BUNDLING, AND MODIFIERS

Fee-schedule leakage is the base case and the most certifiable: the contract fixes a rate by code, place of service, and setting, and underpayment is arithmetic against it. Bundling is the richer vector, because the correctness of a multi-procedure reduction depends on modifier logic the payer does not always honor; enhanced-payment and separately-payable modifiers are frequently disregarded. Bundling is where incumbent appeals most often fail, because the appealer cannot cite the precise correct-coding interaction. The engine wins by carrying the rule, not the argument.

3.3 DOWNCODING, OFFSET, OUTLIER, AND GROUPER

Downcoding is visible in the pair alone: when the billed and paid codes differ, the recode is detectable from the claim and remittance without the full fee schedule, and the contract is needed only to value the difference. Offset and medical-necessity leakage is post-hoc, applying retroactive adjustments and prior-period offsets to accounts where the provider is least likely to notice. Outlier and grouper leakage is low-volume and high-dollar: outlier add-ons omitted on high-cost claims are individually large and individually provable, while inpatient and outpatient grouping, where expected payment equals a base rate times a weight, is the most complex to reconstruct and the largest in exposure.

3.4 IMMEDIATE VERSUS CUMULATIVE IMPACT

The financial impact has two horizons. The immediate horizon is the recoverable balance on the closed-account population, bankable on appeal. The cumulative horizon is the run-rate leakage that continues with every new remittance cycle until the underlying contract behavior is corrected. The first is addressed by a retrospective pass; the second by continuous audit and, ultimately, by the renegotiated terms that population evidence makes possible.

WHY THE CONTRACT IS THE ONLY ADMISSIBLE STANDARD

04 The Contract as Ground Truth

Accurate reconstruction is impossible without a complete, machine-readable reading of the payer contract, because the contract is the only admissible standard against which a payment can be judged wrong. This single fact produces the structural moat of the method and of any business built on it: the party that compiles the contract to logic, and seals every finding to that logic, owns the ground truth and the audit trail.

Contract performance is therefore a second axis of analysis alongside line-level recovery. The first axis asks whether a line was underpaid; the second asks whether the contract is itself structured to permit systematic underpayment. A contract dense with discretionary clauses, ambiguous necessity triggers, and retroactive offset rights is engineered for leakage, and that engineering is a finding in its own right for the renewal conversation.

THE MOAT COMPOUNDS

Each compiled contract, each ingested remittance population, and each sealed recovery increases coverage and evidentiary weight. Switching away means rebuilding the compiled base and surrendering the sealed history. The moat is data and lineage, not an interface, which is why the comparables are infrastructure companies.

4.1 THE FIVE ELEMENT FAMILIES

Every payer contract reduces, for forensic purposes, to five families of terms. Each maps to a leakage vector and to a rule pack in the engine.

▷ BASE FEE SCHEDULES	Allowed amounts by code, place of service, and setting. The anchor of every certified finding.
▷ MODIFIERS AND CODING RULES	Modifier dependencies, bundled and unbundled service logic, add-on and multi-procedure reductions. The richest source of recoverable dollars.
▷ ADDENDUMS AND SPECIAL CLAUSES	Retroactive adjustments, clawback clauses, stop-loss and capitation provisions, medical-necessity triggers, and fee-schedule update handling.
▷ EXCLUSIONS AND LIMITATIONS	Service-line exclusions and caps, coordination-of-benefits rules, and payer-discretion clauses. The gray-zone surface.
▷ PAYMENT CALCULATION	Discount formulas, the timing of adjustments and offsets, and the handling of zero-balance and retroactive reconciliations.

Ambiguous language within any family is not resolved by the model. It is flagged, scored as a gray-zone risk, and held for human promotion before it is permitted to compute against a claim.

ONE VARIANCE ENGINE, A STRICT INTERNAL BOUNDARY

05 System Architecture

The engine is a single variance pipeline with a strict boundary between generation and computation. Ingestion accepts remittance, claims, contracts, and fee schedules. Contract intelligence parses the contract to candidate logic. The rule engine holds promoted, machine-readable rules. Reconstruction computes the expected payment per line. Comparison differences expected against actual to produce DREP. Recovery scores and aggregates. Continuous audit repeats the pass on each new cycle. The pipeline is sequential and halts on failure: a finding that cannot pass a stage is held with its failure reason attached.

1. **Ingestion** NO GENERATIVE STEP
   Historical zero-balance remittance (835), claim files (837), payer contracts and addendums, fee schedules.
2. **Contract Intelligence** GENERATIVE · GATED
   Parse of terms, modifier and multi-procedure logic, outlier, carve-out, grouper rules, ambiguity detection.
3. **Knowledge Graph and Rule Engine** DETERMINISTIC
   Contract language compiled to machine logic. Only human-promoted rules compute.
4. **Claim Reconstruction** DETERMINISTIC
   Parse claim lines; reconstruct the expected payment per line in rule order.
5. **Payment Comparison · DREP** DETERMINISTIC
   Expected versus actual. Underpayment, downcoding, bundling, and offsets classified.
6. **Recovery and Continuous Audit** DETERMINISTIC
   Recoverable total, payer trends, confidence scores, weekly surveillance, appeal-package render.

5.1 THE FOUR PRIMITIVES

Every claim the system makes is carried by four primitives, and nothing is published that is not bound to all four. They are the constitutional atoms of the architecture.

▷ EVIDENCEREF	A reference to a source artifact: the claim line, the remittance line, or the contract clause. Evidence is referenced, never paraphrased into a finding, so any finding traces to its source.
▷ TRANSFORMREF	A reference to the computation that produced a value. The transform is reproducible, which is why it may run without permission.
▷ POLICYRESULT	The result of applying a contract rule to a claim: the governing clause and its effect. The bridge from contract language to a machine decision.
▷ CLAIM	The assertion that a line was underpaid by a stated amount under a stated clause. A claim that cannot bind to evidence, a transform, and a policy result is not permitted to exist.

5.2 THE SEVEN-GATE CHAIN

Findings advance through a sequential, halt-on-fail chain that operationalizes the principle that narratives never outrun evidence: DEFINE, WIRE, VALIDATE, PROMOTE, COMPUTE, GATE, RENDER. The PROMOTE gate is decisive, since only a human-promoted contract rule is permitted to compute, and the RENDER gate enforces that no export leaves without its evidence.

5.3 CONFIDENCE TIERS

Every finding is labeled by one of three tiers, and tiers are never blended into a single number. CERTIFIED denotes direct evidence, admissible without inference. MODELED denotes inference from structure, stated with assumptions. INSUFFICIENT EVIDENCE denotes a missing term, surfaced as a forensic signal rather than filled.

WHY TIERS ARE NON-NEGOTIABLE

A blended recoverable figure invites the payer to attack the weakest dollar in it. A tiered waterfall lets the provider pursue the certified tranche immediately and unanswerably, and hold the modeled tranche for negotiation. Forensic discipline is also commercial strategy.

5.4 ZERO-TRUST GOVERNANCE

The governing principle is the separation of deterministic computation from generative inference, and the rule that the two layers never merge. Deterministic math runs autonomously because it is reproducible and governed. Generative parsing of contract language is gated, and no parsed rule computes against a claim until a human promotes it. Math that is reproducible needs no permission; language that is interpreted always does. This separation is what makes the output admissible rather than merely plausible.

5.5 THE ENGINE LAYERS

Contract intelligence is the single generative stage, lifting contract terms into candidate machine logic and flagging ambiguity for promotion. The knowledge graph and rule engine compile promoted rules and relate codes, settings, modifiers, clauses, and effects; only promoted rules participate. Claim reconstruction parses claim files into a consistent structure and applies the promoted rules in a fixed order, base rate, setting adjustment, modifier and multi-procedure logic, outlier and grouper methodology, then any contractual discount or offset, to compute the contractually correct allowance.

5.6 COMPARISON, RECOVERY, AND CONTINUOUS AUDIT

Payment comparison differences the reconstructed expectation against the remittance to produce DREP, classifies each nonzero variance by vector, and binds it to its governing clause. The recovery engine aggregates by confidence tier, computes payer and facility trends, and assigns a recovery likelihood, producing a waterfall rather than a point estimate. Continuous audit repeats the pass on each new remittance cycle, converting a one-time recovery into a standing surveillance posture and accumulating the population evidence that drives renewal leverage.

5.7 THE EVIDENCE SPINE

Underneath everything is the Evidence Spine: a SHA-256 sealed, hash-chained, append-only audit trail that binds every finding to its source, transform, policy result, and claim, and is tamper-evident from the source file to the rendered receipt.

NO ANCHOR, NO CLAIM

The spine enforces the constitution mechanically. No anchor, no claim. No lineage, no publish. A finding without a sealed evidence chain cannot be rendered, by construction. This is the difference between a system that can be audited and a system that asks to be trusted.

06 THE VARIANCE CORE AND ITS AGGREGATION
The DREP Method

DREP, Delta Reimbursed versus Expected Payment, is the forensic core of the method and the exact twin of the sponsor-side variance metric. It is defined per line and aggregated to the population, and every detector in the system is this metric evaluated against a different rule pack, which is the architectural reason a large portfolio rides a small set of cores.

DREP · PER LINE

```
DREP_line = ExpectedPayment( contract, claim_line ) - ActualPayment( remittance_line )
```

Positive DREP is underpayment. The expected payment is reconstructed from promoted rules; the actual is read from the remittance; the difference is arithmetic once the contract is compiled.

RECOVERABLE CAPITAL · POPULATION

```
Recoverable = Σ max( DREP_line, 0 )   partitioned by { CERTIFIED, MODELED, INSUFFICIENT }
```

Only positive deltas are recoverable. The partition by tier is mandatory: the board sees what is certain, what is inferred, and what awaits evidence, never a single blended figure.

6.1 EXPECTED-PAYMENT RECONSTRUCTION

Reconstruction applies the promoted rules in a fixed order to compute the contractually correct allowance for each line. The order is part of the method, because the sequence of adjustments determines the result. Reconstruction is deterministic and reproducible: two runs over the same files with the same promoted rules return the same expected payments, which is the property that lets the comparison stand in front of an audit committee.

6.2 THE DETECTION SURFACE

The detection surface is the set of rule packs that ride the reconstruction. Each is a falsifiable test with a primary primitive, a governing gate, and a confidence tier.

DETECTOR	PRIMITIVE	GATE	TIER
Fee-schedule variance	TransformRef	COMPUTE	Certified
Bundling and modifier	PolicyResult	COMPUTE · GATE	Certified
Downcoding	EvidenceRef	GATE	Certified
Outlier and stop-loss	PolicyResult	COMPUTE · GATE	Certified
Grouper validation	TransformRef	COMPUTE	Modeled
Offset and clawback	Claim	GATE	Modeled

6.3 THE RECOVERABLE-CAPITAL WATERFALL

Recoverable capital is reported as a waterfall by confidence tier, never as a point estimate. The structure forces honesty and, for a chief financial officer, is more persuasive than a single number, because it shows which dollars are bankable today and which become bankable on the next ingestion.

01 **Certified recoverable.** Positive DREP where the contract rate is explicit and the remittance is below it. Bankable on appeal without inference.

02 **Modeled recoverable.** Positive DREP that depends on grouper estimation, class-level inference, or offset reconstruction. Real, stated with assumptions, pursued with appropriate weighting.

03 **Insufficient.** Lines whose governing term is absent. Not zero and not certified: a routed action to obtain the missing language, after which the line reclassifies.

Each certified dollar carries its receipt: the claim line, the remittance line, the contract clause, and the reconstruction transform. That bundle is the appeal package, generated rather than drafted, which is why no export leaves the system without its evidence.

07 THE BUILD ASYMMETRY
The Product Portfolio

The method yields a portfolio of twelve falsifiable products in four families. The strategic point is the asymmetry between the product count and the engineering count: twelve sellable products ride on roughly four to eight compute cores, because most are different rule packs on the one expected-versus-actual variance engine. The variance core is built once; the detection families are configuration; the population and action layers are aggregation and rendering on top.

THE STRATEGY IN ONE LINE

Build the variance engine once, then sell it twelve ways. The gap between twelve products and a handful of cores is the entire capital-efficiency thesis of the build, not a footnote.

Each product is specified as a single falsifiable test. The four families are Contract Intelligence, Claim-versus-Contract Detection, Population Intelligence, and Action and Recurring. The wedge, shipped first, is the Zero-Balance Reopener powered by the Expected-Payment Reconstructor.

7.1 THE TWELVE PRODUCTS

#	PRODUCT	FALSIFIABLE TEST	TIER
01	Payer Contract X-Ray	N rules extracted from one contract; M validate against payments.	Cert
02	Gray-Zone Exploit Map	Rank exploitable clauses; show one claim where each was used.	Mod
03	Expected-Payment Reconstructor	Per line, contract-derived expected versus actual; flag the delta.	Cert
04	Zero-Balance Reopener ★	Across closed accounts, recover lines the contract says were underpaid.	Cert
05	Downcoding Detector	Billed code versus paid code; flag silent recodes.	Cert
06	Bundling and Modifier Auditor	Correct-coding and contract bundling logic; enhanced and separate pay.	Cert
07	Stop-Loss and Outlier Auditor	Outlier-threshold claims paid without the add-on.	Cert
08	DRG / APC Validator	Expected equals base rate times weight versus paid.	Mod
09	Shady Payer Index	Per payer, systematic underpayment rate relative to peers.	Mod
10	Board Roll-Up	One figure, every dollar tiered and clickable to its receipt.	Tier
11	Appeal Package Generator	A complete, clause-cited recovery packet per flagged claim.	Cert
12	Continuous Audit	Each cycle, new remittance surfaces new recoverable dollars.	Cert

7.2 CONSTITUTIONAL MAPPING

Every product resolves to the same primitives and gate chain. Generative steps are gated; deterministic steps run free; missing terms are surfaced. The mapping is what lets a heterogeneous portfolio share one governed core.

7.3 SEQUENCING

Sequencing follows leverage and time-to-proof. The wedge ships first; the detection surface extends next with the appeal generator; the population layer, board roll-up, and continuous-audit subscription follow.

PRIORITY	PRODUCTS	OUTCOME
P0	Reconstructor, Zero-Balance Reopener	First certified recovery, no integration
P1	Downcoding, Bundling, Outlier, Appeal Generator	Full retrospective recovery with receipts
P2	Shady Payer Index, Board Roll-Up, Continuous Audit	Renewal leverage and recurring revenue

08 FROM LINE TO POPULATION
Population Intelligence

Line-level recovery is the immediate prize; the durable prize is the pattern. Aggregated across a population spanning multiple payers, DREP reveals systematic behavior, which payer downcodes which codes, where denials cluster, and how adjustment patterns differ from peer norms. The Shady Payer Index makes the pattern legible.

SHADY PAYER INDEX

```
SPI(payer) = systematic underpayment rate(payer) - peer benchmark rate
```

Positive index marks a payer that underpays above the population norm. Modeled by construction and built for the renewal table rather than the courtroom: leverage, not a single claim.

A payer that downcodes a high-acuity code at several times the rate of a peer is not making random errors; it is running a policy. The surveillance layer documents that policy with the evidence to prove it, and a shift in a payer pattern surfaces as a change in the index before it shows up as a material revenue impact.

8.1 NEGOTIATION LEVERAGE

The same evidence that wins a single appeal, aggregated, reprices the contract. Where line-level DREP recovers the past, the index reshapes future terms. At renewal the provider arrives not with a grievance but with a documented, payer-specific pattern of systematic underpayment and the recoverable dollars to match. The instrument therefore pays twice: once in recovery, once in renegotiated terms.

8.2 THE BOARD ROLL-UP

The board roll-up is the one-screen, four-tile executive surface: total recoverable capital with every dollar tiered and clickable to its receipt, the leakage decomposed by vector and payer, and the trend over time. It translates the engine output into a board-level capital decision.

THE FOUR HARD RULES, ON THE SURFACE

One screen, four tiles, always. Every number clickable into its receipt. No export without receipts. Narratives never outrun evidence.

09 FROM RECOVERED CLAIM TO ENTERPRISE VALUE
Economic Value

Every recovery translates into capital along a defined bridge. A recovered underpayment drops through to EBITDA at near-full margin, converts to free cash flow, and is capitalized at the system multiple, with a further increment as payer-behavior risk is made visible and contestable.

The bridge is the language the board speaks. It reframes a recovery from a back-office collection into a capital event, which is why the chief financial officer, not a clinical or technical buyer, is the right owner of the relationship.

9.1 NEAR-100% DROP-THROUGH

The drop-through claim is not rhetorical. The service was rendered and expensed in a prior period, so a recovered dollar carries no offsetting cost; it converts to EBITDA almost dollar for dollar. For a board weighing capital allocation, that places revenue integrity above almost any growth initiative on a risk-adjusted basis: the return is contractual, the evidence is sealed, and the downside is the cost of the audit alone.

9.2 THE FUTURE-STATE DIGITAL TWIN

The end state is a continuously learning reimbursement-intelligence system, a digital twin of every payer contract that, for each claim ever paid, answers a fixed interrogation, with each answer a tiered, receipt-bearing claim.

THE EIGHT QUESTIONS

▷ Q1 / Q2	What should have been paid, and why was it paid differently?
▷ Q3 / Q4	Was the variance contractually justified, and which clauses support recovery?
▷ Q5 / Q6	What is the recoverable amount, and the likelihood of a successful appeal?
▷ Q7 / Q8	Is the issue isolated or systemic, and what is the total potential leakage?

FIDUCIARY-GRADE BY CONSTRUCTION

10 Governance, Risk, and Boundaries

The governance posture is the method central claim to defensibility. Every finding is sealed to the Evidence Spine, labeled by confidence tier, and bound to the four primitives. Generative steps are gated; deterministic steps run autonomously; missing terms are surfaced rather than assumed. Fiduciary-grade is not an adjective here; it is the operational consequence of the constitution, which makes it structurally impossible to publish a number that is not supported by referenced evidence and a reproducible transform.

10.1 SECURITY AND PRIVACY

The system processes protected health information and confidential contract terms. Detection logic and sensitive match lists do not ship client-side; the client receives findings and receipts, not the mechanism. The append-only sealed lineage provides an audit trail for every access and transformation, and data handling follows the principle of minimum necessary.

10.2 RISK REGISTER

RISK	MITIGATION
Contract parsing errors	Generative parse is gated; no rule computes until a human promotes it.
False-positive findings	Tiers and the gate chain hold unsupported findings; certified only on explicit rates.
Payer dispute of recoveries	Every dollar carries its receipt: clause, claim line, remittance line, transform.
Data access and security	Append-only sealed lineage, minimum-necessary handling, logic withheld client-side.
Inference uncertainty	Marked modeled, stated with assumptions, never netted against certified recoveries.

10.3 BOUNDARIES: WHAT DOES NOT SHIP

Three boundaries are permanent. Sensitive detection logic does not ship client-side. A payer relying on undocumented terms returns insufficient evidence rather than a manufactured finding. No exported claim leaves without its full evidence bundle. When a required term is absent, that gap is itself a finding that tells the provider precisely which document to obtain to convert an uncertain line into a certified recovery.

SHIP THE UNANSWERABLE TEST

11 Deployment and the Wedge

Deployment resists the platform and ships a single falsifiable test. The wedge is the Zero-Balance Reopener powered by the Expected-Payment Reconstructor, narrowed to a minimum demonstrable unit: one payer, one high-volume code, and the closed-account population. The claim reduces to one sentence the buyer cannot refute: you closed this account, and here is the clause that says you left this on the table.

INPUT 1	One signed payer contract, current term.
INPUT 2	One batch of historical zero-balance remittance and claim files.
SCOPE	One payer, one high-volume code, the closed-account population.
OUTPUT	Aggregate certified DREP, every dollar clickable to its governing clause.
INTEGRATION	None. No electronic medical record, no payer portal. The provider supplies its files.

11.1 THE NINETY-DAY PROOF PLAN

01 **Days 1 to 30.** Ingest one contract and one batch of zero-balance files; compile the contract, promote rules for one high-volume code, and reconstruct the expected payment across the closed-account population.

02 **Days 31 to 60.** Certify the DREP on that code, partition recoverable capital by tier, and generate appeal packets for the certified tranche. Present the recoverable number as the diligence.

03 **Days 61 to 90.** Extend to additional codes and detectors, stand up the board roll-up, and define the continuous-audit feed. Convert the proof into a standing engagement.

11.2 DEMO AS DILIGENCE

The defining property of the wedge is that the demonstration is the diligence. It runs on the buyer own closed accounts and produces the buyer own recoverable number, which is simultaneously the proof of capability and the basis of the engagement. The skeptic supplies the data that defeats the skepticism, which collapses the sales cycle and inverts the burden of proof.

WHAT THIS PAPER DOES AND DOES NOT CLAIM

12 Discussion and Limitations

The contribution of this paper is a method and its surrounding architecture, value model, and governance, not a measured recovery on a named provider. The vector and the method are presented as certifiable; the dollar quantum for any specific provider is, by our own standard, insufficient evidence until that provider claim and remittance files are ingested. We regard this as a feature rather than a hedge: the paper shows precisely which evidence certifies each finding, so the path from the method to a certified number is a data ingestion, not a further study.

Three limitations are worth naming. First, the certified tier depends on the contract stating an explicit rate; where it does not, findings are modeled or routed, not certified. Second, grouper-dependent reconstruction is modeled until the grouper logic is fully deterministic for a given contract. Third, the method recovers what the contract obligates; it does not adjudicate whether the contract terms themselves are favorable, though the population layer surfaces unfavorable structure for renegotiation.

Finally, the method assumes access to the provider own files. It requires no integration into clinical or portal systems, but it does require the remittance and claim records and the governing contract, and its certified output is only as complete as those inputs.

CONCLUSION

13 The Mandate

We have argued that commercial-payer underpayment is an information rent produced by a verification-cost asymmetry, that a reconciled zero-balance account is an unexercised option rather than a settled one, and that a deterministic, evidence-sealed variance engine inverts the asymmetry and returns the rent to the party that earned it. The method is falsifiable, the architecture is governed, and the output is board-defensible.

The deepest case, however, is not financial. Underpayment is how margin is quietly extracted from the institutions least able to absorb it: the rural systems, the safety-net hospitals, the service lines that close one bad year before anyone names the cause. The dollars lost to systematic underpayment are the staffed bed, the open clinic, the program that survives because the revenue it earned was the revenue it received. The receipt that wins an appeal is the same receipt that defends the capacity to keep a door open.

> Disruption by math, not by marketing. Receipts, not narratives. *Revenue integrity, done with evidence, is a precondition for care.*

I believe in myself.

JEREMIAH FRANKLIN SHRACK · CHAIRMAN AND CEO · SIRIUSB iQ · KINCAID RMC · CARMEL, INDIANA

REFERENCES

Akerlof, G. A. (1970). The Market for Lemons: Quality Uncertainty and the Market Mechanism. *Quarterly Journal of Economics*, 84(3), 488 to 500.

Stigler, G. J. (1961). The Economics of Information. *Journal of Political Economy*, 69(3), 213 to 225.

Coase, R. H. (1937). The Nature of the Firm. *Economica*, 4(16), 386 to 405.

Williamson, O. E. (1985). *The Economic Institutions of Capitalism*. Free Press, New York.

Ries, E. (2011). *The Lean Startup*. Crown Business, New York.

Blank, S. G. (2013). *The Four Steps to the Epiphany* (3rd ed.). K and S Ranch.

A NOTE ON SOURCES

The economic argument rests on four foundational results in the economics of information and the theory of the firm, cited above. The treatment of the minimum viable product as a single falsifiable test draws on the customer-development and lean-startup traditions. Healthcare transaction formats and coding systems referenced throughout are industry standards; their definitions appear in the appendix.

APPENDIX · LEXICON AND DATA STANDARDS

METRICS AND PRIMITIVES

DREP · Delta Reimbursed vs Expected Payment
UWI · Underpayment Waste Index
SPI · Shady Payer Index
DRAP · Delta Realized vs Allowable Pricing (sponsor-side parent)
EvidenceRef · TransformRef · PolicyResult · Claim
Evidence Spine · SHA-256 sealed, hash-chained, append-only

DATA AND STANDARDS

835 · electronic remittance advice
837 · electronic claim
NCCI · National Correct Coding Initiative edits
DRG / APC · inpatient and outpatient grouping
Modifiers · 22, 25, 59, 76, 77 and dependencies
POS · place of service

THE SEVEN GATES

DEFINE → WIRE → VALIDATE → PROMOTE → COMPUTE → GATE → RENDER

PROVENANCE AND STANDARD

Derived from the working note on artificial-intelligence-driven detection of commercial-payer underpayments, read as the provider-side mirror of the Capital Efficiency Intelligence engine. Magnitudes are graded; certification of dollar findings for any provider requires ingestion of that provider files. The standard is constant: no assertion outruns its evidence.

Kincaid IQ · Payer IQ

SiriusB iQ · CEI-WP-05 · v1