Turbulent Arbitrage in Reinsurance: Regulating Capital and the Cycle*

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Abstract

Reinsurance prices rise after catastrophes and fall as capital accumulates, usually explained by the cost of external capital. This article reads the underwriting cycle through Anwar Shaikh's theory of real competition. The price of a reinsurance layer is regulated by the lowest-cost reproducible form of risk capital: expected loss, plus that capital's operating costs, plus profit-of-enterprise over the interest rate on the capital it must advance. Because collateralised vehicles post the full limit while rated reinsurers diversify, the regulating capital differs by layer, and a narrower gap between profit and interest extends the domain of collateralised capital. Sector data for 2006–2025 and firm data for fifteen reinsurers filing with the US Securities and Exchange Commission show returns on equity gravitating around market-implied required returns with no measurable persistence, while net capital flows, at sector and firm level, follow return shortfalls rather than past profits. The cycle appears as a turbulent equalisation of profit rates.

JEL classification: B51, G22, L16, E32. *Keywords*: real competition; regulating capital; reinsurance; underwriting cycle; alternative capital.

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1 Introduction

Reinsurance prices rise sharply after a year in which catastrophe losses or falling asset values have destroyed part of the industry's capital, and drift down as capital is rebuilt and new capital arrives. The latest swing was unusually compressed: Hannover Re reported an inflation- and risk-adjusted price increase of 8.0% on its treaty renewals of 1 January 2023 and an average decline of 3.2% three years later (Hannover Re, 2023; 2026), while the capital that Aon counts as available to reinsurance grew from 575 to 785 billion dollars between the end of 2022 and the end of 2025 (Aon, 2026b).

Insurance economics explains such swings mainly through frictions in the supply of capital: if external equity is costly, a loss contracts supply until retained earnings or new issues restore capital, and prices rise in the meantime (Winter, 1994; Gron, 1994; Cummins and Danzon, 1997). This explains the deviations well but says much less about the level around which prices fluctuate, and its benchmark, expected loss plus a risk-adjusted cost of capital, sits awkwardly with catastrophe cover selling at several times its expected loss although catastrophe risk is nearly uncorrelated with financial markets (Froot, 2001; Froot and O'Connell, 2008).

Anwar Shaikh's theory of real competition starts from a different place. Firms set prices and cut costs to win market share; capital moves in search of the highest expected return on new investment; and profit rates are equalised as a turbulent process around a centre of gravity fixed by the regulating capitals, the lowest-cost methods of production that are generally reproducible (Shaikh, 1980; 2008a; 2016, ch. 7; reviewed in this journal by Martínez Hernández and Isidro Luna, 2020). Reinsurance comes close to an ideal case: it has no proprietary technology to protect, its principal input is capital, a new vehicle can be writing business within months, and large catastrophes periodically destroy part of the incumbents' capital.

The theory of real competition has been examined mainly on manufacturing industries and broad sectoral aggregates (Tsoulfidis and Tsaliki, 2005; Vaona, 2012; Bahçe and Eres, 2013; Shaikh, 2016, pp. 295–322), and Shaikh's extension to finance concerns banks, the interest rate and the prices of bonds and equities (Shaikh, 2016, ch. 10). Insurance, an industry in which the commitment of capital is itself the product sold, has not been studied in this framework, and the insurance literature has no account of what regulates the centre of gravity of reinsurance prices.

This article makes three contributions. First, it derives the regulating price of a reinsurance layer as expected loss plus the operating costs of the regulating capital plus profit-of-enterprise, the excess of the general rate of profit over the interest rate, on the capital advanced per unit of cover; the multiple of expected loss at which catastrophe cover sells is then no puzzle. Second, because a collateralised vehicle posts the full limit while a rated reinsurer holds capital only against a layer's contribution to a diversified book,

the regulating capital differs by layer, with a frontier that moves with the gap between profit and interest; a dynamic version, solved in an appendix, shows why realised returns and the returns expected on new capital diverge after a shock. Third, sector data for 2006–2025 and firm data for fifteen reinsurers that file with the United States Securities and Exchange Commission show returns gravitating around the market-implied required return without measurable persistence, catastrophe specialists falling behind diversified reinsurers as alternative capital grows, and net capital flows that follow return shortfalls rather than past profits.

Section 2 places real competition against the insurance-cycle literature, Section 3 derives the regulating price and its dynamics, Section 4 presents the evidence, Section 5 discusses what the case adds to the theory and implies for public risk transfer in Latin America, and Section 6 concludes.

2 Real competition and the reinsurance cycle

2.1 Regulating capitals and turbulent arbitrage

Shaikh's starting point is the classical conception of competition as rivalry between firms, developed by Smith, Ricardo and Marx and restated against the neoclassical theory of perfect and imperfect competition (Clifton, 1977; Semmler, 1984; Botwinick, 1993; Shaikh, 2016, chs. 7–8). Within an industry, producers with different costs sell at roughly the same price, set by the competitive pressure of the regulating capitals, the best-practice methods that new investment can reproduce. Firms are price setters, and the firm with lower unit costs can cut price to gain share and still earn an adequate return (Shaikh, 2016, pp. 259–295). Because incumbents operating older or higher-cost methods coexist with regulating capitals, average rates of profit can differ persistently across industries. What competition equalises are the expected rates of return on new investment in the regulating capitals (Shaikh, 2008a).

Between industries, equalisation works through the movement of capital: where the expected return on new investment exceeds the general rate, capital flows in and price falls; where it falls short, accumulation slows and price rises. The process overshoots in both directions and never comes to rest, because shocks keep displacing it and the centre of gravity moves with costs. Shaikh calls the result turbulent arbitrage (Shaikh, 2016, ch. 7; see also Duménil and Lévy, 1987). Since the profit rates of regulating capitals are not directly observable, he proposes the incremental rate of profit, the change in gross profit divided by the previous period's gross investment, as an empirical proxy (Shaikh, 2016, p. 298; see also Shaikh, 2008b). Tests on Greek, Turkish, OECD and United States data find that incremental rates equalise more clearly than average rates (Glick and Ehrbar, 1988; Lianos and Droucopoulos, 1993; Tsoulfidis and Tsaliki, 2005; Vaona, 2012; Bahçe

and Eres, 2013; Kemp-Benedict, 2023).

Shaikh carries the argument into finance. Banks are capitalist enterprises whose profit rate tends to the general rate, and the interest rate is the price of banking output, regulated by that tendency; bond and equity yields in turn gravitate around the real rate of return (Shaikh, 2016, ch. 10). Drafts in his archive, partly written with Jamee K. Moudud, extend the argument to the determination of stock prices (Shaikh, 2005). Interest, in this classical reading, is a part of profit, and what drives active investment is the difference between the two, Marx's profit-of-enterprise (Marx, 1981 [1894], ch. 23). A reinsurer is an enterprise of exactly this kind: it advances money capital, holds it in interest-bearing assets and earns, on top of the interest, whatever margin its underwriting yields.

2.2 What the insurance-cycle literature explains, and what it leaves open

The underwriting-cycle literature, surveyed by Weiss (2007), attributes the fluctuations to lags in data, rate regulation and policy renewal (Cummins and Outreville, 1987), questions whether they are regular enough to forecast (Boyer, Jacquier and van Norden, 2012) and, most influentially, to capacity constraints: when external capital is costly, a loss shock reduces the supply of cover and raises its price until capital is rebuilt (Winter, 1994; Gron, 1994; Cummins and Danzon, 1997; Harrington and Niehaus, 2000). Actuarial writers have long described the cycle as the outcome of rivalry, entry and exit, as in other industries (Feldblum, 1990), and conventional pricing under fundamental uncertainty helps explain why the cycle leaves a protection gap that risk-based premiums do not close (Aslan, 2026b).

Real competition accepts the mechanism of the capacity-constraint models and changes three things around it. The benchmark is no longer a price-taking equilibrium at which marginal cost, inclusive of a risk-adjusted cost of capital, equals price; it is a regulating price set by the costs of the lowest-cost reproducible capital, around which price-setting firms compete. The return that capital must earn is not a premium tied to the covariance of the risk with financial markets; it is the general rate of profit on the capital advanced. And the fluctuations are the form in which equalisation proceeds.

The second change bears on a long-standing puzzle. Froot (2001) documents that catastrophe reinsurance was priced at several times its expected loss even though, under the capital asset pricing model, near-zero correlation with market returns should leave little room for a risk premium. Froot and O'Connell (2008) examine costly capital and market power as explanations. Under real competition the gap is not anomalous: a reinsurer must advance capital to write a catastrophe layer, and that capital must earn the general rate of profit whatever the correlation of the losses with other assets. Section 3 makes this precise.

3 The regulating price of a reinsurance layer

3.1 Capital advanced and the rate of profit

Consider a reinsurance layer j, with limit normalised to one unit. Its expected loss is ℓ_{j}, the probability-weighted payment per unit of limit, measured on the catastrophe models or loss experience on which the market prices. A unit of capital of form c that writes the layer must advance $\kappa_{\mathrm{c,j}}$ per unit of limit, holding it in assets that yield the short-term interest rate i, and incurs operating and frictional costs e_{c} per unit of limit: acquisition and administration, the costs of holding capital in a rated and taxed corporate form, and, for collateralised vehicles, fronting, structuring and fund-management fees. Let p_{j} be the premium per unit of limit. Expected profit per unit of limit is

$$\pi_{c,j} = p_j - \ell_j - e_c + i\,\kappa_{c,j} \tag{1}$$

and the expected rate of profit on the capital advanced is

$$\rho_{c,j} = \frac{p_j - \ell_j - e_c}{\kappa_{c,j}} + i \tag{2}$$

Equation (2) states the classical decomposition directly. The capital advanced earns interest i because it is held in interest-bearing assets; the underwriting margin, divided by the capital it ties up, is the profit-of-enterprise that rewards the decision to commit capital to risk rather than to lend it.

3.2 The regulating price

Capital flows into the layer while the expected rate of profit on new capital exceeds the general rate r, and out of it while it falls short. The capital that sets the terms of this arbitrage is the form that can be reproduced at the lowest cost. Setting $\rho_{\mathrm{c,j}} = r$ for that form and solving for the premium gives the regulating price

$$p_j^* = \ell_j + \min_c \left[e_c + (r - i)\,\kappa_{c,j} \right] \tag{3}$$

The margin over expected loss, $p^*_{\mathrm{j}} - \ell_{\mathrm{j}}$, has two components: the operating costs of the regulating capital, and profit-of-enterprise, $r - i$, on the capital that must be advanced per unit of limit. It depends on the general rate of profit, not on the correlation of the layer's losses with financial markets, which is why catastrophe layers are priced well above expected loss. It depends on the interest rate only through $r - i$, so a rise in short-term rates with an unchanged general rate lowers the regulating margin. And it depends on which form of capital regulates.

Two forms coexist. A rated reinsurer writes the layer as part of a diversified book and

holds capital against the layer's contribution to the tail of that book. A collateralised vehicle (a catastrophe bond, a collateralised reinsurance fund or a sidecar) must post the full limit in a trust account, so that $\kappa_{\mathrm{A}} = 1$. For the rated balance sheet, let $\theta_{\mathrm{j}} \in [0, 1]$ measure the tail dependence of layer j on the incumbent's book: the share of the layer's limit that is lost in the scenarios that determine the reinsurer's capital requirement. A layer exposed to the reinsurer's peak peril has θ_{j} close to one; a layer whose losses arise independently of the rest of the book has θ_{j} close to zero. A simple specification is

$$\kappa_{T,j} = [\kappa_0 + (1 - \kappa_0)\,\theta_j]\,(1 - \ell_j) \tag{4}$$

where $\kappa_0 > 0$ is the minimum charge that rating and supervisory models impose on any exposure. Collateralised capital regulates layer j when its cost per unit of limit is the lower of the two, that is, when

$$\kappa_{T,j} > \kappa^* \equiv 1 - \frac{e_T - e_A}{r - i} \tag{5}$$

with $e_{\mathrm{T}} > e_{\mathrm{A}}$ because the collateralised vehicle avoids the corporate costs of a rated balance sheet. Differentiating the threshold,

$$\frac{\partial \kappa^*}{\partial (r - i)} = \frac{e_T - e_A}{(r - i)^2} > 0 \tag{6}$$

3.3 Implications for the structure of the market

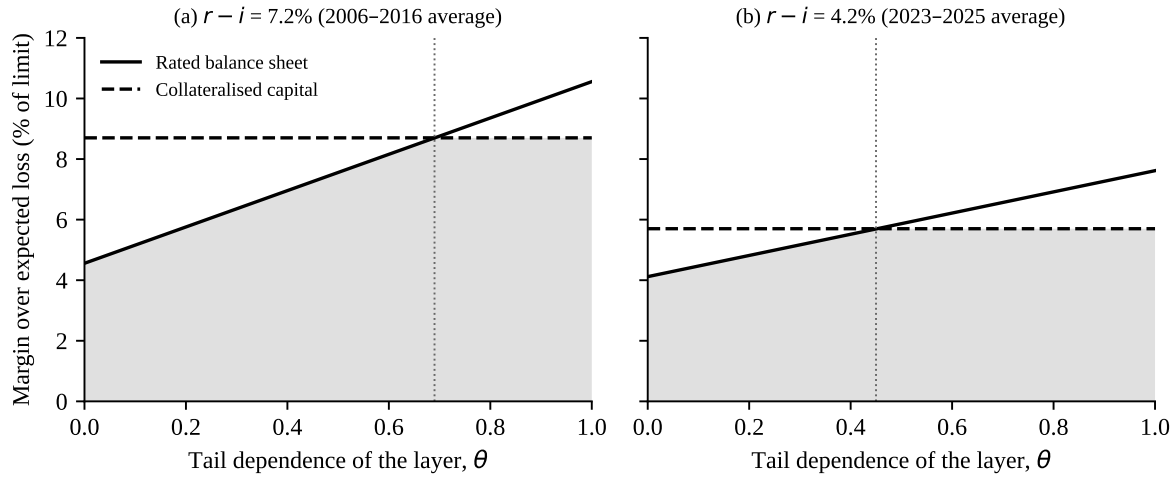
Two implications follow. The first is that reinsurance has no single regulating capital. Collateralised capital regulates the price of layers that are tail-dependent on the incumbents' books, the peak-peril catastrophe layers and retrocession where it has in fact concentrated (Cummins and Weiss, 2009), while rated balance sheets regulate diversifying and lower layers. The industry is a set of segments whose prices are regulated by different forms of capital, with a frontier between them that moves.

Second, by equation (6), a narrowing of profit-of-enterprise over the interest rate lowers the threshold κ^* and extends the domain of collateralised capital, because the cost of posting the full limit is charged at $r - i$. Figure 1 illustrates with the parameters given in its note and values of $r - i$ equal to the averages of the market proxy constructed in Section 4 for 2006–2016 (7.2%) and 2023–2025 (4.2%). Over that interval the threshold value of θ falls from 0.69 to 0.45: on these parameters, collateralised capital becomes the regulating capital for a substantially larger share of the layer structure.

3.4 Turbulent arbitrage over time

Let K_{t} be the capital committed to a segment at the start of year t and D_{t} the limit that buyers demand at the regulating price, with κ units of capital required per unit of limit.

Figure 1. Regulating margin by form of capital: a numerical illustration



Notes: Margin over expected loss per unit of limit, $e_c + (r - i)\kappa_c$, for a rated balance sheet (solid line) and collateralised capital (dashed line), as a function of the layer's tail dependence θ on the incumbent's book. Parameters: $\ell = 0.02$, $\kappa_0 = 0.15$, $e_T = 0.035$, $e_A = 0.015$; $r - i$ is set to the averages of the proxy defined in Table 1 for 2006–2016 and 2023–2025. The shaded area is the regulating margin, the lower of the two; the dotted line marks the threshold of equation (5). *Sources*: equations (3)–(5); Damodaran (2026a; 2026b); own calculations.

The market margin over expected loss, $m_{\mathrm{t}} = p_{\mathrm{t}} - \ell$, falls as capital becomes abundant relative to demand:

$$m_t = m^* - \varphi\left(\frac{K_t}{\kappa D_t} - 1\right) \tag{7}$$

where $\varphi > 0$ and $m^* = e + (r - i)\kappa$ is the regulating margin of equation (3). The realised rate of profit differs from the expected rate by the loss surprise u_{t}, actual less expected losses per unit of limit:

$$\rho_t = i + \frac{m_t - e - u_t}{\kappa} \tag{8}$$

Capital at the next renewal is the capital carried over plus retained profit plus net new capital, and net new capital responds to the gap between the rate that new capital expects at the next renewal and the general rate:

$$K_{t+1} = K_t\left(1 + \rho_t - \delta\right) + \gamma K_t\left(\rho^e_{t+1} - r\right) \tag{9}$$

where δ is the share of capital paid out as dividends, $\gamma > 0$ measures how quickly capital responds, and $\rho^{\mathrm{e}}{}_{\mathrm{t}+1} = i + (m_{\mathrm{t}+1} - e)/\kappa$, with $m_{\mathrm{t}+1}$ given by equation (7) at the capital carried into the renewal. In the stationary state, $u_{\mathrm{t}} = 0$, $K_{\mathrm{t}} = \kappa D_{\mathrm{t}}$ and $\rho_{\mathrm{t}} = r$. A catastrophe ($u_{\mathrm{t}} > 0$) lowers the realised rate, cuts the capital carried over and, through equation (7), raises the margin and the expected rate on new capital at the next renewal, so net capital flows are negatively correlated with the previous year's realised return; a

benign year works the other way. The speed of return to m^* is governed by γ, which is high where capital can be raised within months. Appendix A shows that, to a first approximation, the stationary state is stable, net new capital covaries negatively with the previous year's realised differential, and the realised differential has a small negative first-order autocorrelation; for the parameters in the replication package the first correlation is -0.58 (-0.55 in a non-linear simulation).

Two further implications follow. Because treaties run for a year and capital is committed afresh at each renewal, there are no vintages of fixed capital to preserve differences in return, and deviations of average returns from the general rate should show little persistence from one year to the next. Persistent differences between firms remain possible where cost conditions differ: an incumbent writing layers regulated by collateralised capital at a cost above the regulating cost earns less than r on that business, until exit, consolidation or higher attachment points move its portfolio back towards layers it regulates.

4 Evidence, 2006–2025

4.1 Data and measurement

The sector's rate of profit is measured by the return on equity of the composite of leading reinsurers for which Aon reports a series from 2006, a group of roughly twenty to thirty companies that, by Aon's account, write around half of world non-life reinsurance premium (Aon, 2019; 2025; 2026a). Values are spliced from three editions of the report, as documented in the replication package. Capital, divided into traditional equity and alternative (third-party) capital, follows Aon's estimates of global reinsurer capital (Aon, 2019; 2026b).

The firm-level data cover fifteen reinsurance groups that file annual reports with the United States Securities and Exchange Commission. Net income attributable to shareholders and year-end shareholders' equity are taken from the structured financial data of their 10-K and 20-F filings for 2007–2025 (SEC, 2026a), giving 169 firm-years of return on average equity from 2009. Most of these companies are domiciled in Bermuda, and several stopped filing during the period, so the panel is unbalanced.

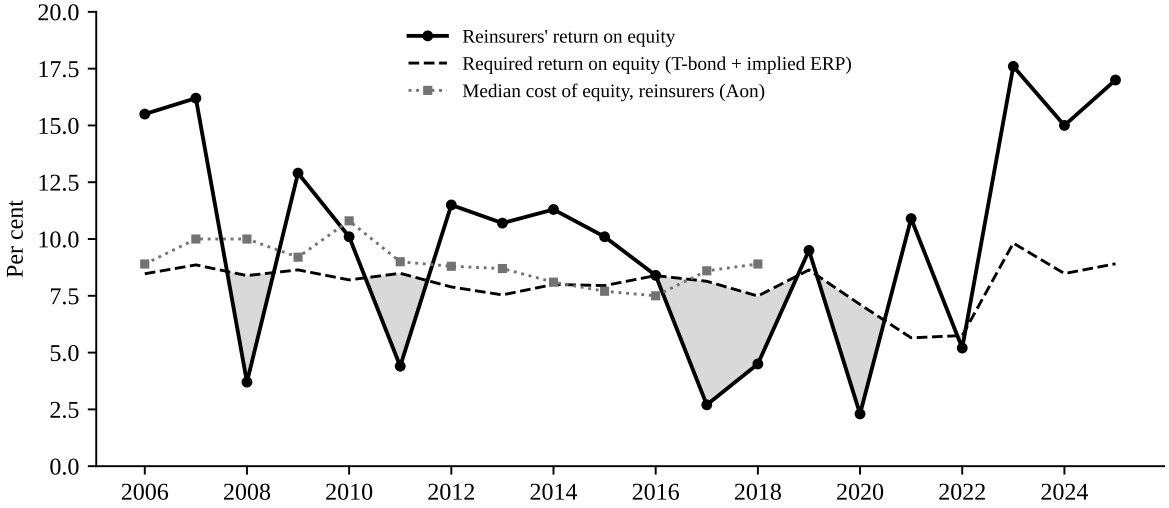
Two benchmarks stand in for the general rate of profit as it confronts money capital. The first is the market-implied required return on equity, the ten-year United States Treasury yield plus Damodaran's implied equity risk premium, both measured at the start of each year (Damodaran, 2026a). The second, available for 2006–2018, is the median cost of equity of the composite's members as estimated by Aon (2019). The two average 8.2% and 8.9% over the years they share. The proxy for profit-of-enterprise over the bill rate, $r - i$, is the first benchmark less the annual return on three-month Treasury bills (Damodaran, 2026b).

Return on equity is an average, realised, accounting rate, subject to the distortions that accounting rates carry (Fisher and McGowan, 1983). Section 3.4 gives a reason to expect it to track the rate on new business closely here, but twenty annual observations at sector level allow descriptive tests rather than precise estimates.

4.2 Gravitation of the sector's rate of profit

Figure 2 plots the composite's return on equity against both benchmarks. Returns fall below the benchmark in years of heavy catastrophe, pandemic or financial-market losses (2008, 2011, 2017–2018, 2020, 2022) and rise above it in between, with the largest positive deviations in 2006–2007 and 2023–2025, the years after the hurricane seasons of 2005 and the capital losses of 2022.

Figure 2. Reinsurers' return on equity and required returns, 2006–2025



Notes: Return on equity of the reinsurer composite tracked by Aon; market-implied required return as defined in Table 1; median cost of equity of the composite's members as estimated by Aon, available to 2018. Shading marks years in which the return on equity falls short of the market-implied required return. *Sources*: Aon (2019; 2025; 2026a); Damodaran (2026a).

Table 1 summarises the differential. Against the market-implied required return, the mean differential over 2006–2025 is 1.9 points, with a heteroskedasticity- and autocorrelation-consistent standard error of 1.0 ($p = 0.06$). The differential changes sign ten times in twenty years. Its first-order autocorrelation is 0.12, with a standard error of 0.25, so that a deviation in one year carries almost no information about the next; the augmented Dickey-Fuller statistic rejects a unit root at the 1% level. Against Aon's estimate of the cost of equity, the mean differential over 2006–2018 is 0.4 points and statistically indistinguishable from zero, with an autocorrelation of 0.05.

The sub-period averages in panel B add a qualification consistent with Section 3.4. In 2017–2022 the composite earned 5.9% on average against a benchmark of 7.1%; Aon's (2023) own assessment at the time put the six-year average return at about two-thirds

Table 1. Reinsurers' return on equity relative to required returns, 2006–2025

	Market-implied required return	Median cost of equity (Aon)
Panel A. Differential, return on equity minus benchmark (percentage points)		
Period	2006–2025	2006–2018
Mean	1.93	0.45
Standard error (HAC)	(1.04)	(1.20)
p-value, mean = 0	0.06	0.71
Standard deviation	4.51	4.44
Years above benchmark	14 of 20	8 of 13
Changes of sign	10	5
First-order autocorrelation	0.12 (0.25)	0.05 (0.30)
Augmented Dickey–Fuller statistic	−3.59 (0.006)	−3.14 (0.024)

Panel B. Averages (per cent)	2006–2016	2017–2022	2023–2025	2006–2025
Return on equity	10.4	5.9	16.5	10.0
Market-implied required return	8.3	7.1	9.1	8.0
Differential	2.2	−1.3	7.5	1.9
Alternative capital, share at end of period	13.6	16.2	17.3	17.3
Proxy for $r - i$	7.2	5.9	4.2	6.3

Notes: The market-implied required return is the ten-year United States Treasury yield plus the implied equity risk premium, both at the start of the year. HAC: Newey–West standard error with one lag. The first-order autocorrelation is the OLS coefficient of the differential on its own lag, with its standard error in parentheses. The augmented Dickey–Fuller regression includes a constant and no lagged differences; MacKinnon p-values in parentheses. The proxy for $r - i$ is the market-implied required return less the annual return on three-month Treasury bills. *Sources*: Aon (2019; 2025; 2026a; 2026b); Damodaran (2026a; 2026b); own calculations.

of the average cost of equity. In these years alternative capital held around 15% of the total, and incumbents wrote catastrophe layers at prices formed in competition with it. The shortfall ended with the incumbents' repricing of 2023, when they raised prices and attachment points together; the positive mean over the whole period owes much to the three years that followed.

4.3 Persistence at the level of the firm

Sector averages can conceal persistent differences between firms. Table 2 applies the persistence-of-profits specification of Mueller (1986) to each firm's differential from the market-implied required return. The core sample excludes Greenlight Re and Maiden, two firms whose losses relative to equity were extreme in several years; including them is reported as a robustness check.

Table 2. Persistence of firms' return differentials, SEC-filing reinsurers, 2009–2025

	Core sample	Full sample
Firms	13	15
Firm-years with a lagged observation	126	157
Pooled first-order autocorrelation	0.01 (0.13)	0.36 (0.21)
Pooled, with firm fixed effects	−0.07 (0.12)	0.19 (0.17)
Firms with at least eight observations	7	9
Mean (median) of firm autocorrelations	0.05 (0.11)	0.14 (0.14)
Firms with significant autocorrelation	1	1
Firms with significant long-run differential	1	1
Mean interquartile range of returns (points)	7.7	10.5

Notes: The differential is the firm's return on average shareholders' equity less the market-implied required return. Pooled OLS with standard errors clustered by firm in parentheses. Firm-level regressions follow Mueller (1986): the differential on a constant and its own lag; the long-run projected differential is the constant divided by one minus the autocorrelation, with a delta-method standard error; significance at the 5% level. Core sample: Alterra, Arch Capital, Aspen, Endurance, Everest, Flagstone Re, Montpelier Re, PartnerRe, Platinum Underwriters, RenaissanceRe, Third Point Re (SiriusPoint), Transatlantic and Validus; the full sample adds Greenlight Re and Maiden. *Sources*: SEC (2026a); Damodaran (2026a); own calculations.

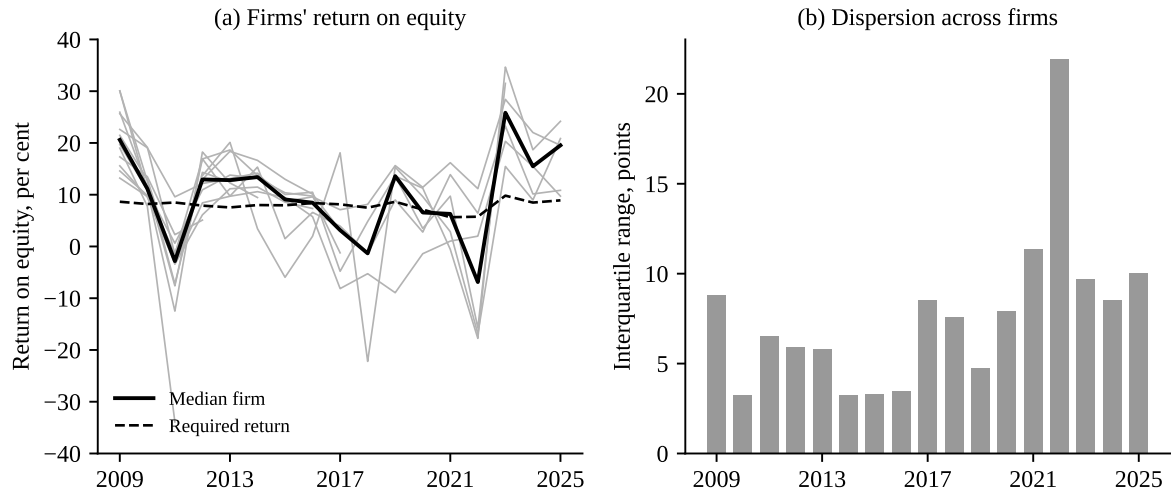
In the core sample of thirteen firms, the pooled first-order autocorrelation of the differential is 0.01, with a standard error clustered by firm of 0.13, and −0.07 with firm fixed effects. Studies of manufacturing and service firms in developed economies typically find persistence coefficients between about 0.2 and 0.6 (Puziak, 2017). Including the two excluded firms raises the pooled coefficient to 0.36, with a standard error of 0.21, a result driven by one firm's continuing losses.

The cross-section moves as the theory describes (Figure 3). The interquartile range of firms' returns was between 3 and 4 points in the calm years 2010 and 2014–2016, widened to 11 and 22 points in 2021 and 2022, and narrowed to between 8.5 and 10 points in 2023–2025. Shocks disperse returns; competition draws them together again around a

centre of gravity that the median firm crosses repeatedly.

Equation (5) also implies a pattern across firms: those concentrated in catastrophe layers compete most directly with collateralised capital, so their returns should fall behind those of diversified reinsurers as alternative capital grows. Four firms in the core sample describe property-catastrophe or short-tail reinsurance as their principal business: RenaissanceRe, Montpelier Re, Flagstone Re and Validus (Montpelier Re, 2012; SEC, 2026b). A regression of firms' differentials on firm and year effects, the specialists' exposure to the sector's catastrophe losses and their interaction with the share of alternative capital, for 2009–2019 and 2022, gives an interaction coefficient of −0.76: as that share rose from 5% in 2010 to 15% in 2017, the specialists' differential fell by about seven points relative to the rest. Of the 715 ways of assigning four of the thirteen firms to the group, 3.2% give a coefficient as negative. The estimate is −0.82 without Validus and −0.69 with Platinum Underwriters, which describes itself as a multi-class reinsurer, but −0.56 ($p = 0.12$) for the four firms whose returns respond most to catastrophe losses.

Figure 3. Return on equity of SEC-filing reinsurers, 2009–2025



Notes: Panel (a): return on average shareholders' equity of each firm in the core sample of Table 2 (grey lines), of the median firm (solid line), and the market-implied required return (dashed line). Panel (b): interquartile range of the firms' returns in each year. *Sources*: SEC (2026a); Damodaran (2026a); own calculations.

4.4 Capital flows

If capital chased realised profits, capital growth would rise after years of above-benchmark returns. Equation (9) predicts the opposite, and Table 3 is consistent with it. In panel A, the growth of alternative capital is negatively but imprecisely related to the previous year's sector differential. For traditional equity, controlling for the current return on equity, which captures retained earnings, and the Treasury return, which captures marked-to-market changes in bond portfolios, the coefficient is −0.95 (standard error 0.32): a year in which

the composite earns one point more than the benchmark is followed by equity growth, beyond what current earnings explain, about one point lower; total capital behaves the same way.

Table 3. Capital flows and the previous year's return differential

Panel A. Sector level, 2007–2025	(1) Alternative capital	(2) Traditional equity	(3) Traditional equity, excl. 2022–2023	(4) Total capital
Return differential, $t-1$	−0.51	−0.95***	−0.51*	−0.91***
	(0.73)	(0.32)	(0.30)	(0.29)
Return on equity, t		1.45***	1.07***	1.42***
		(0.29)	(0.32)	(0.27)
Ten-year Treasury return, t		0.17	−0.15	0.14
		(0.19)	(0.13)	(0.18)
Constant	11.77***	−10.08***	−5.22	−8.99***
	(3.71)	(3.48)	(3.34)	(3.21)
Observations	19	19	17	19
R^2	0.03	0.56	0.45	0.59
Panel B. Firm level, 2009–2025	(5) Core sample	(6) Core, excl. 2022–2023	(7) Core, excl. merger years	(8) Full sample
Sector return differential, $t-1$	−1.05***	−0.99***	−0.90***	−0.90***
	(0.25)	(0.28)	(0.29)	(0.26)
Firm return on equity, t	0.18	0.14	0.04	0.08
	(0.15)	(0.22)	(0.13)	(0.07)
Ten-year Treasury return, t	0.07	0.02	0.17*	0.04
	(0.09)	(0.12)	(0.10)	(0.12)
Firm fixed effects	Yes	Yes	Yes	Yes
Firm-years (firms)	136 (13)	124 (13)	131 (13)	169 (15)

Notes: Panel A: dependent variable, log growth of the capital series multiplied by 100; the differential is the sector's return on equity less the market-implied required return; OLS with Newey–West standard errors (one lag). Excluding 2008 and 2022 from column (2), the coefficient on the lagged differential is −0.30 (0.24). Panel B: dependent variable, the change in the firm's shareholders' equity less its net income, as a percentage of opening equity; Driscoll–Kraay standard errors (one lag). Samples as in Table 2; the merger years are Alterra 2010, PartnerRe 2009, Validus 2009, Endurance 2015 and SiriusPoint 2021. Standard errors in parentheses; *, ** and *** denote significance at the 10, 5 and 1% levels. *Sources*: Aon (2019; 2025; 2026a; 2026b); Damodaran (2026a; 2026b); SEC (2026a); own calculations.

At sector level the precision rests on 2008 and 2022, when financial-market losses cut equity after good years: excluding 2022 and 2023 the coefficient is −0.51 ($p = 0.09$), and excluding 2008 and 2022 it is −0.30 ($p = 0.20$).

The firm data allow a sharper test. Net capital raised is the change in a firm's shareholders' equity less its net income, as a share of opening equity: positive when it issues shares, negative when it pays out more than its profit. Panel B of Table 3 regresses it on the sector's lagged differential, the firm's current return on equity and the Treasury return, with firm fixed effects and the standard errors of Driscoll and Kraay (1998), which allow for shocks common to all firms in a year. A sector return one point above the

benchmark is followed by net capital raised about one point lower, an estimate that keeps its size and significance without 2022 and 2023, without the five firm-years of share-financed mergers, and in the full sample. With the firm's own lagged differential added, correlated with the sector's at 0.63, the two are jointly significant ($p = 0.01$).

The most recent episode follows this sequence. Capital fell by about 15% in 2022, when rising interest rates marked down bond portfolios and Hurricane Ian added a large catastrophe loss (Aon, 2023), and prices at the following January renewal rose 8.0% (Hannover Re, 2023). Returns then exceeded the benchmark by 6.5 to 8.1 points a year in 2023–2025, capital grew by 37% and alternative capital by 46%, and Hannover Re's January price changes turned from +2.3% in 2024 to −2.1% in 2025 and −3.2% in 2026, with the sharpest reductions in catastrophe business, the segment that collateralised capital regulates (Hannover Re, 2024; 2025; 2026).

The expansion of alternative capital after 2022 coincides with the narrowing of the proxy for $r - i$, from 7.2 points in 2006–2016 to 4.2 in 2023–2025, as equation (5) predicts, and primary-market pricing fits the cross-sectional side of the argument: bonds on peak perils, which load on the tail of reinsurers' books, sell at much higher multiples of expected loss than bonds on perils that diversify those books (Lane and Mahul, 2008). Alternative capital also grew rapidly in 2011–2017, however, when the gap was wide, and catastrophe bond prices point the same way. By equation (3), an investor's yield over expected loss, collateral return included, should gravitate around $r + e_{\mathrm{A}}$; at the end of January 2026 it was 6.5%, of which 3.7 points was the return on collateral (Artemis, 2026a), against a market-implied required return of 8.4%, and the spread above expected loss on new issues fell to 3.7% in the second quarter of 2026, its lowest in five years (Artemis, 2026b). Either the owners of collateralised capital accept less than the general rate, or the market-implied benchmark overstates the rate that regulates money capital seeking this kind of asset; tranche-level pricing data would separate the two.

5 Discussion

The reinsurance case adds three things to the theory of real competition. The first is that one industry can contain several regulating capitals, distinguished by the form in which capital is advanced rather than by technique. Cost per unit of cover depends on how much capital each form must advance against a given layer, so the frontier between the forms is a price-theoretic object that the theory can locate, and it moves with a variable the theory already contains, the excess of profit over interest.

The second is speed. Reinsurance capital is committed afresh at each renewal and can be raised in months, so turbulent arbitrage, usually studied over long periods, is fast enough to observe in annual data: the absence of persistence in firm-level differentials, which the model predicts to be slightly negative, reflects a turnover time of one year. The

third concerns interest and profit. In Shaikh's account the interest rate is regulated by the profit rate through the competition of banking capitals (Shaikh, 2016, ch. 10); equation (3) shows the other side of the relation, since the interest rate enters the price of risk-bearing through $r - i$.

The argument bears directly on public risk transfer in Latin America. In 2006 Mexico's disaster fund, FONDEN, bought US$450 million of parametric earthquake cover for 2007–2009, of which a US$160 million bond, the first parametric catastrophe bond issued by a sovereign, supplied the smaller part and reinsurance the rest, the bond covering almost all of one seismic zone and reinsurers most of the other two (Cárdenas et al., 2007; World Bank, 2013). Mexico returned to the bond market with multi-peril issues of US$290 million in 2009 and US$315 million in 2012 (World Bank, 2013). How much a sovereign needs to transfer depends in turn on the fiscal capacity it retains after a disaster, which its monetary sovereignty shapes (Aslan, 2026a). Equation (5) implies that such a programme should allocate each zone or layer between forms of capital according to its tail dependence on reinsurers' books, which placement data could test; equation (3), that a sovereign buying collateralised layers when bill rates are high should pay a lower margin, although Section 4.4 suggests that this pass-through cannot be taken for granted. Solvency rules and rating models also shape the frontier, since they fix κ_0 and the capital charges behind $\kappa_{\mathrm{T}}(\theta)$: capital regulation is a parameter of competition between forms of capital, and public catastrophe schemes can use equation (3) as a reference price that does not depend on the market price of a particular year (on the design of such schemes, see Aslan, 2026b).

Return on equity is an average rate for a changing group of firms; the theory concerns expected rates on regulating capital. A sharper test would use supervisory reinsurance data, such as the Solvency II templates, and tranche-level catastrophe bond prices to measure prices, attachment points and capital forms by layer, so that the frontier in equation (5) could be estimated rather than illustrated.

6 Conclusion

The reinsurance underwriting cycle has usually been read as a departure from competitive equilibrium caused by frictions in the supply of capital. Read through Shaikh's theory of real competition, it is the form that the equalisation of profit rates takes in an industry whose product is the commitment of capital: the margin over expected loss is profit-of-enterprise on the capital advanced plus the operating costs of the lowest-cost reproducible form of capital, and the regulating capital differs across layers, with a frontier that moves with the excess of profit over interest.

The evidence for 2006–2025 is consistent with this reading. The sector's return on equity gravitates around the market-implied required return, crossing it ten times in twenty years; the deviations of individual reinsurers show essentially no persistence from one year

to the next, and catastrophe specialists fall behind diversified reinsurers as alternative capital grows; dispersion widens after shocks and narrows again; and net capital flows, at sector and firm level alike, follow return shortfalls rather than past profits. The next step is to move from accounting averages to layer-level prices and capital forms, so that the regulating capitals can be identified segment by segment.

Data availability

All data used in Section 4 come from the published sources listed in the references. A replication package with the data, the code and the figure files, which reproduces every table and figure, is available from the author.

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Appendix A. Stability and covariances of the dynamic model

Hold demand constant at D, set $\delta = r$, so that a segment earning r keeps its capital, and write $x_t \equiv K_t/(\kappa D) - 1$ for the deviation of capital from its stationary level, $a \equiv \varphi/\kappa$ and $b \equiv \gamma\varphi/\kappa$. To first order in x_t, equations (7)–(9) give the realised differential and the capital carried into the next renewal as

$$d_t \equiv \rho_t - r = -a\,x_t - \frac{u_t}{\kappa} \tag{A1}$$

$$x^c_{t+1} = (1-a)\,x_t - \frac{u_t}{\kappa} \tag{A2}$$

Net new capital at that renewal, as a share of capital, is $f_t = \gamma(\rho^e{}_{t+1} - r) = -b\,x^c{}_{t+1}$, so that

$$x_{t+1} = (1-b)\left[(1-a)\,x_t - \frac{u_t}{\kappa}\right] \tag{A3}$$

Proposition. Let the loss surprises u_t be independent, with mean zero and variance σ^2, and let $0 < a < 2$ and $0 < b < 2$. Then (i) the stationary state is stable; (ii) net new capital, and with it the expected rate on new capital, covaries negatively with the realised differential of the year before the renewal; and (iii) if $b < 1$, the realised differential has a negative first-order autocovariance.

Proof. The autoregressive coefficient in equation (A3), $c \equiv (1-a)(1-b)$, lies strictly between -1 and 1, which gives (i), and the stationary variance of x_t is $V = (1-b)^2\sigma^2/[\kappa^2(1 - c^2)]$. Because x_t is independent of u_t, equations (A1)–(A3) give

$$\mathrm{Cov}(f_t, d_t) = ab(1-a)V - \frac{b\sigma^2}{\kappa^2} = -\frac{b\sigma^2}{\kappa^2}\,\frac{1-(1-a)(1-b)^2}{1-c^2} \tag{A4}$$

$$\mathrm{Cov}(d_{t+1}, d_t) = a^2 c\,V - \frac{a(1-b)\sigma^2}{\kappa^2} = -\frac{a(1-b)\sigma^2}{\kappa^2}\,\frac{1-(1-a)(1-b)^2}{1-c^2} \tag{A5}$$

Since $(1-a) < 1$ and $(1-b)^2 < 1$, the product $(1-a)(1-b)^2$ is below one; with $1 - c^2 > 0$, the last fractions in (A4) and (A5) are positive, and both covariances are negative, the second when $b < 1$. Because $f_t = \gamma(\rho^e{}_{t+1} - r)$, the expected rate on new capital has the same sign of covariance with d_t as net new capital.