RESEARCH ARTICLE

Liquidity Risk in the Reimbursement Cycle: A Daily Treasury Model of Eleven EU-Funded Municipal Social Projects

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Abstract

European structural funds reach beneficiaries after they have spent, and prefinancing is meant to bridge the interval; this paper asks whether the bridge is long enough for small local governments. It is a forward-looking design study rather than an account of observed cash flows: it takes the approved budgets and contractual disbursement schedules of eleven Romanian rural municipalities whose social service projects were contracted for implementation between 2026 and 2029, worth 54.42 million lei in total, and models each project's treasury position day by day. Prefinancing is treated as an advance recovered from later reimbursement claims, so gross inflows sum to 194.9 per cent of the budget while net inflows equal it, and expenditure starts with implementation rather than with the first request. With every request paid on the day it is submitted, all eleven projects run a financing gap. The mean peak gap is 600 584 lei, or 12.14 per cent of the budget, and every project reaches its deepest point on the day before the first prefinancing instalment. Because start dates differ while that date does not, that moment falls between day 79 and day 142 of each project, and the municipalities that wait longest carry the largest gaps. A Monte Carlo simulation with 4 000 draws of validation delays raises the ninety-fifth percentile of the gap to 19.37 per cent of budget on average, and each day of uniform delay adds approximately 45 852 lei to the aggregate gap. Delay widens the gap; the calendar creates it.

Keywords: prefinancing; financing gap; local government; cohesion policy; Monte Carlo simulation; validation delay

JEL Classification: H74; H72; G32; R51

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1. INTRODUCTION

Cohesion policy pays beneficiaries after they have spent. A municipality that wins a grant contracts staff, buys equipment, pays suppliers, submits a claim with the evidence attached, waits for the claim to be verified, and only then receives the money. Prefinancing exists so that this sequence can be survived by a beneficiary that has no reserves of its own, and the size and timing of the prefinancing instalments are written into the financing contract for exactly that reason. Whether the arrangement

actually shields the beneficiary from having to fund the project out of its own resources is an empirical question, and it is one that is rarely asked with the contract in hand.

This paper asks it for eleven Romanian rural municipalities that have contracted social service projects for older people under the same call, with implementation running from 2026 to 2029. It uses two documents per project, the approved eligible budget and the disbursement schedule annexed to the financing contract, and it models the resulting treasury position day by day. What it studies is the design of the projects rather than their outcome. None of the eleven had reached its first prefinancing instalment when the analysis was carried out; the first instalment falls due, on the contractual calendar, on 20 September 2026. The model is therefore forward-looking in the plain sense: it describes the liquidity that the contracts, as signed, will require of the beneficiaries if everything goes according to plan, and it then asks how much worse things become when verification takes time.

Two modelling choices distinguish the exercise from a simple reading of the schedule, and both are decisive for the result. The first concerns prefinancing. Adding the scheduled prefinancing requests to the scheduled reimbursement requests produces a total of 194.9 per cent of the eligible budget, which cannot be a description of money received. Prefinancing is an advance, and it is recovered by deduction from subsequent reimbursement claims; the reimbursement claims in these eleven schedules sum to the eligible budget to within 0.06 RON. The model therefore credits each reimbursement only for the portion that has not already been advanced, so that cumulative net receipts converge to the budget and not to twice the budget. The second choice concerns the moment at which spending begins. A model that starts expenditure on the date of the first prefinancing request finds no gap at all, because money and spending arrive together. Implementation, however, begins when the contract says it begins, and the first request comes later. In these eleven projects the interval between the start of implementation and the first prefinancing request runs from 80 to 143 days, during which salaries are paid and equipment is bought with nothing coming in.

The contribution of the paper is to quantify the consequence of these two facts and to locate it in the calendar. The financing gap is structural: it is present in every one of the eleven projects on the contractual schedule with no delay assumed, it peaks on the same day in every case, and it is larger for the municipalities that started earlier relative to a first-instalment date that was fixed at the level of the call. Verification delay, which is where most of the policy discussion of reimbursement risk concentrates, adds to the gap at a rate that the paper estimates, but it does not create it.

This paper belongs to a set of three that analyse the same eleven approved project budgets from different angles. A companion study examines the cost structure of the budgets and what a template-built budget implies for the separate accounting obligation (Almasan, 2026a). A second paper in the present issue derives the stream of operations subject to preventive financial control from the same budgets and links each day spent in the control sequence to the liquidity cost estimated here (Almasan, 2026b). The three papers share the dataset, and each states so; the disbursement schedules, which carry the timing information, are analysed in the present paper.

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What follows is organised in five further sections. Section 2 reviews the literature on absorption and liquidity in cohesion policy, on the prefinancing and reimbursement rules of the current programming period, on municipal treasury management and on simulation methods for cash-flow risk. Section 3 sets out the data and the model. Section 4 reports the results on the contractual schedule and under simulated delays. Section 5 discusses what the results mean for programme design and for the beneficiaries, and Section 6 concludes with the limitations of the exercise and the work that should follow it.

2. LITERATURE REVIEW

2.1 Absorption Capacity and the Liquidity Constraint

Research on the absorption of European structural funds has been dominated by the question of administrative capacity. Milio (2007) showed, for the Italian regions, that differences in implementation performance under the same rules were largely explained by the quality of regional administration rather than by the level of development, and the argument was carried to the new member states by Surubaru (2017), who found that administrative capacity and the quality of political governance jointly explain much of the variation in absorption across the 2007–2013 period. Incaltarau et al. (2020) extended the comparison to the full set of old and new member states and confirmed that administrative capacity and governance quality are the most consistent predictors of absorption, with the effect of governance strongest precisely in the countries that joined after 2004. Tosun (2014), working at the level of regional operational programmes, reached a compatible conclusion and added that the design of the programme itself, and not only the administration implementing it, shapes the pace at which funds are drawn.

Liquidity appears in this literature as a constraint on the beneficiary rather than on the administration, and it appears early. Zaman and Georgescu (2009), writing at the start of Romania's first full programming period, identified the co-financing requirement and the reimbursement mechanism as obstacles for beneficiaries with thin own budgets, and warned that local authorities would struggle to pre-fund expenditure while waiting for verification. Bachtler and Mendez (2007), analysing the governance of cohesion policy reform, had already noted that the shift of implementation responsibilities to the member states placed the financial burden of delays on the beneficiary side. The European Court of Auditors has returned to the theme repeatedly: its review of performance-based financing in the 2014–2020 period found that the link between payment and results was weakened in practice by the need to keep funds flowing to beneficiaries (European Court of Auditors, 2021), and its comparison of cohesion policy with the Recovery and Resilience Facility drew attention to the very different cash positions in which the two instruments leave a beneficiary during implementation (European Court of Auditors, 2023). The Court's most recent annual report records that, three years into the 2021–2027 period, payments under the cohesion funds remained well

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behind commitments (European Court of Auditors, 2024). The Ninth Cohesion Report documents the persistent lag between commitment and payment at programme level in the cohesion countries (European Commission, 2024), and the payment rates published on the Cohesion Open Data Platform show the same lag programme by programme (European Commission, 2025).

What this literature does not contain is a treatment of the beneficiary's treasury at the resolution of the financing contract. Absorption is measured in the aggregate, as the share of an allocation paid out by a given date, and the liquidity constraint is inferred from surveys or from the slow start of programmes rather than modelled from the documents that create it. The present paper works at the other end of the scale, one contract at a time, and asks what the contract itself implies.

2.2 Prefinancing and Reimbursement Under the 2021–2027 Rules

The rules governing payments to beneficiaries in the current period are set out in the Common Provisions Regulation (European Parliament & Council of the European Union, 2021b). Two of its provisions matter for the model. Article 74(1)(b) requires the managing authority to ensure that a beneficiary receives the amount due in full and no later than 80 days from the date of submission of the payment claim, subject to the availability of funding; that ceiling is the outer bound of the validation delay that Section 3 treats as a random variable. Article 54 allows indirect costs to be declared as a flat rate of up to 15 per cent of eligible direct staff costs, which is the option used in all eleven budgets studied here and which, as the companion cost-structure paper shows, produces an indirect cost line that is an arithmetic function of personnel rather than a record of consumption (Almasan, 2026a). The projects are financed from the European Social Fund Plus, whose own regulation frames the social service interventions of the kind contracted by the eleven municipalities (European Parliament & Council of the European Union, 2021a). The Financial Regulation defines pre-financing, for the Union budget as a whole, as an advance intended to provide the beneficiary with a float that is cleared against subsequent payments (European Parliament & Council of the European Union, 2024), and that definition is the one the model implements.

At national level, the financial management of the 2021–2027 funds allocated to Romania is governed by Government Emergency Ordinance No. 133/2021 (Government of Romania, 2021). The ordinance provides for prefinancing to beneficiaries in tranches, each conditional on the justification of part of the preceding tranche, and for the recovery of prefinancing by deduction from reimbursement claims. The disbursement schedules studied here are the contractual expression of those provisions: they set out, for each project, the dates and amounts of the prefinancing requests and of the reimbursement requests over the life of the project. Every payment made under a project also passes through the ordinary Romanian public expenditure sequence and through the preventive financial control visa attached to it (Government of Romania, 1999), which is the point at which the present model connects with the analysis of control workload in the companion paper (Almasan, 2026b).

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The interaction between prefinancing and reimbursement has a consequence that is obvious once stated but that a casual reading of a schedule misses. Because the advance is recovered from later claims, the gross amounts written into the schedule sum to far more than the budget. A model that credits the schedule gross overstates the beneficiary's liquidity by roughly the size of the budget; a model that ignores prefinancing understates it. The construction in Section 3 threads between the two.

2.3 Municipal Liquidity and Treasury Management

Public financial management treats cash management as the problem of ensuring that the government can meet its payment obligations as they fall due at the lowest cost, and it locates the solution in the consolidation of balances, the forecasting of flows and the smoothing of timing mismatches (Lienert, 2009; Williams, 2010). The treasury single account is the institutional device that makes consolidation possible (Pattanayak & Fainboim, 2010). For Romanian local governments the relevant features are that budgets are executed through the State Treasury rather than through commercial bank accounts, that short-term credit is available only within the limits set by the local public finance law (Parliament of Romania, 2006), and that borrowing is subject to a debt service ceiling expressed as a share of own revenues. A rural commune with own revenues that are small relative to a five million RON project has, in practice, no overdraft to draw on.

Work on subnational finance more broadly emphasises how much of public investment passes through local governments (OECD, 2023) and how thin their own resource base is in the cohesion countries (OECD & United Cities and Local Governments, 2022). Eurostat's government finance statistics show local government in Romania to be a modest sector by the standards of the Union, financed to a large extent by transfers from the central budget (Eurostat, 2025), which is the position in which a European project of the size studied here represents a multiple of the beneficiary's discretionary spending. Padovani et al. (2021) proposed a framework for assessing the financial vulnerability of municipalities in a crisis and identified liquidity, rather than solvency, as the dimension on which small local governments are exposed first. The older theory of the demand for cash by organisations facing irregular flows, from Miller and Orr (1966) onwards, is the conceptual background: a beneficiary whose inflows are lumpy and whose outflows are continuous needs a buffer whose size depends on the variance of the flows and the cost of running out, and the question the present paper answers is how large that buffer has to be when the inflows are the ones written into a financing contract.

2.4 Simulation and Cash-Flow-at-Risk in Public Finance

Cash-flow-at-risk was developed in corporate finance as the counterpart of value-at-risk for entities whose exposure is to operating flows rather than to the market value of a portfolio. Stein et al. (2001) proposed measuring it by comparing a firm's cash-flow volatility with that of comparable firms; the method has since been applied to any setting in which the quantity of interest is a percentile of the

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distribution of a future cash position. Monte Carlo simulation is the standard tool for obtaining that percentile when the position depends on several random inputs and cannot be integrated analytically (Glasserman, 2003). In project appraisal the same logic underlies the reference-class approach of Flyvbjerg et al. (2002), who showed that cost estimates for public works are systematically optimistic, and the later argument of Flyvbjerg and Gardner (2023) that schedule risk in large projects is driven by delays in the early phases rather than by cost overruns at the end. The finding of the present paper, that the gap is opened in the first months of implementation, is a small-scale instance of the same pattern.

Simulation has been used in public finance mostly at the macro level, for debt sustainability fan charts and for the assessment of fiscal risks, and comparatively little at the level of a single beneficiary's treasury. The internal audit profession has recently placed the assessment of financial risk, including liquidity, explicitly within the scope of the assurance that internal audit is expected to provide (Institute of Internal Auditors, 2024), which gives a practical audience for a model of the kind developed here. The model is deliberately simple. Its purpose is not to forecast the cash position of any one municipality but to identify the mechanism by which the contract creates a liquidity requirement and to size that requirement under stated assumptions.

3. METHODOLOGY

3.1 Data and Anonymisation

The dataset consists of two documents for each of eleven projects: the approved eligible budget, which gives the total value and its distribution across cost categories, and the disbursement schedule annexed to the financing contract, which gives the date, the type and the amount of every prefinancing and reimbursement request over the life of the project. The eleven projects were contracted under the same call, in one Romanian county, to finance home-care and community services for older people, and are to be implemented between 2026 and 2029. The same set of eleven approved project budgets is analysed in the two companion papers (Almasan, 2026a, 2026b); the disbursement schedules are the additional input of the present paper. The documents were made available through the author's advisory work with the beneficiaries, with their consent, and the identities of the municipalities are withheld throughout.

Taken together, the eleven projects have an eligible value of 54.42 million lei (RON), with individual budgets between 4.78 and 4.98 million. Ten projects have a contracted duration of 42 months and one of 36. Together the eleven schedules contain 252 dated events: 133 reimbursement requests, 108 prefinancing requests and 11 final reimbursement requests. The municipalities are numbered M1 to M11 in the order of the financing contracts. Because the applications were prepared in the same period with the same assistance, several of the budgets were built from a common template, and two of them, M1 and M3, have identical budgets and identical calendars; the model

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accordingly returns identical results for the pair, and Section 4 reports them as such rather than treating the coincidence as an anomaly.

3.2 Expenditure

Expenditure is modelled at daily resolution over the contracted implementation period. Personnel, meals for participants, target-group activities and indirect costs are spread uniformly over the duration of the project. Equipment is spread over the first six months, reflecting the front-loaded procurement of the fixed assets that the budgets provide for. The start of implementation is derived as the contractual end date minus the contracted duration.

Uniform spreading is an approximation, and it is worth being clear about what it does and does not affect. Real payroll is paid monthly and real equipment purchases are lumpy, so the true expenditure path is a step function around the modelled line. The quantity of interest, however, is the cumulative position rather than the daily balance, and the cumulative position of a step function tracks that of its uniform approximation closely over horizons measured in months. The peak gap, which occurs after several months of spending and immediately before an instalment, is not materially affected. The daily balance within a month, which the approximation does distort, is not reported.

Two conventions are stated because they affect reported quantities. The horizon of each project ends at its last scheduled cash-flow event rather than being padded to the contractual end date. A day is counted as being in deficit only if the cumulative position is below minus one leu; without that convention the count is decided by a residual of a few bani left by the clearing arithmetic, which is not an economic quantity.

3.3 Inflows and the Recovery of the Advance

Each prefinancing instalment is credited in full on its scheduled date. Each reimbursement is credited net of the recovery of the outstanding advance, at a project-specific recovery rate equal to total scheduled prefinancing divided by total scheduled reimbursements. Writing P_j for the amount of the j-th prefinancing request, R_j for the amount of the j-th reimbursement request and α for the recovery rate, the net receipt from a reimbursement is given by Equation (1):

$$\text{R}_\text{j} = \text{R}_\text{j} \times (1 - \alpha), \quad \alpha = \Sigma \text{P}_\text{j} \,/\, \Sigma \text{R}_\text{j} \tag{1}$$

Across the eleven projects α ranges from 0.889 to 0.956, which is another way of saying that between 89 and 96 per cent of each budget is scheduled to be advanced before being earned. The construction guarantees that cumulative net receipts equal the eligible budget: the residual after the final instalment is at most 0.06 RON in absolute value in any of the eleven projects, which is rounding. The cumulative net position on day t is then the running sum of inflows and outflows, as in Equation (2), where E(s) is the modelled expenditure on day s and the sums run over all events dated on or before t:

$$\text{C}(\text{t}) = \Sigma_\{\text{s} \le \text{t}\}\ \text{P}(\text{s}) + \Sigma_\{\text{s} \le \text{t}\}\ \text{R}(\text{s}) - \Sigma_\{\text{s} \le \text{t}\}\ \text{E}(\text{s}) \tag{2}$$

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3.4 The Financing Gap

The financing gap of a project is the deepest negative value reached by its cumulative net position over the horizon, and it is also expressed as a share of the eligible budget B, as in Equation (3):

$$G = \max_t [\, -C(t) \,], \quad g = G \,/\, B \tag{3}$$

Defined this way, the gap is the amount that the municipality must find from sources other than the grant at the worst moment of the project. It is a stock, not a flow, and it is measured at a single date. The aggregate gap across the eleven projects can be defined in two ways, and the distinction matters for the results. The sum of the eleven project-level gaps is the amount that would be needed if every project reached its deepest point on the same day. The gap of the aggregated position, obtained by summing the eleven daily positions first and then taking the deepest point of the total, is lower whenever the eleven minima do not coincide. On the contractual schedule the two coincide, for a reason that Section 4 explains; under random delays they do not, and both figures are reported.

3.5 Delay Scenarios

Two departures from the contractual schedule are examined. A deterministic sensitivity applies the same delay, in calendar days, to every prefinancing and reimbursement request, from zero to 180 days in steps of 15, and records the aggregate gap at each step. A Monte Carlo simulation with 4 000 draws assigns each request an independent delay drawn from a normal distribution with a mean of 45 days and a standard deviation of 20 days, truncated at zero, and records the peak gap of each project in each draw. The median and the ninety-fifth percentile of the resulting distribution are reported for each project, together with the ninety-fifth percentile of the aggregated eleven-project position.

The central assumption of 45 days is a working figure for the interval between the submission of a request and its payment, not an observed average, and it is chosen with the regulatory ceiling in mind. Under Article 74(1)(b) of the Common Provisions Regulation the beneficiary is to be paid within 80 days of submission; a normal distribution with mean 45 and standard deviation 20 places roughly 95 per cent of its mass below 78 days, so the simulated delays are, in the great majority of draws, inside the legal limit. The deterministic sensitivity is reported alongside the simulation precisely so that a reader who believes a different central delay to be realistic can substitute it. Delays are drawn independently across requests; the consequence of that assumption for the upper tail is discussed in Section 6.

4. RESULTS

4.1 The Contractual Schedule Already Produces a Gap

Figure 1 shows the cumulative net position of the eleven projects on the contractual disbursement schedule, with every request paid on the day it is submitted, plotted against time from the earliest implementation start. The pattern is a sawtooth. The position falls as expenditure accumulates, jumps

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when a prefinancing instalment arrives at intervals of about four months, dips more shallowly and recovers slightly when the small net amounts of the reimbursement requests are credited, and falls again. In every project the position is negative for at least 555 days; in seven of the eleven it is negative for virtually the entire horizon of about 1 157 days, and the average across the eleven is 960 days in deficit.

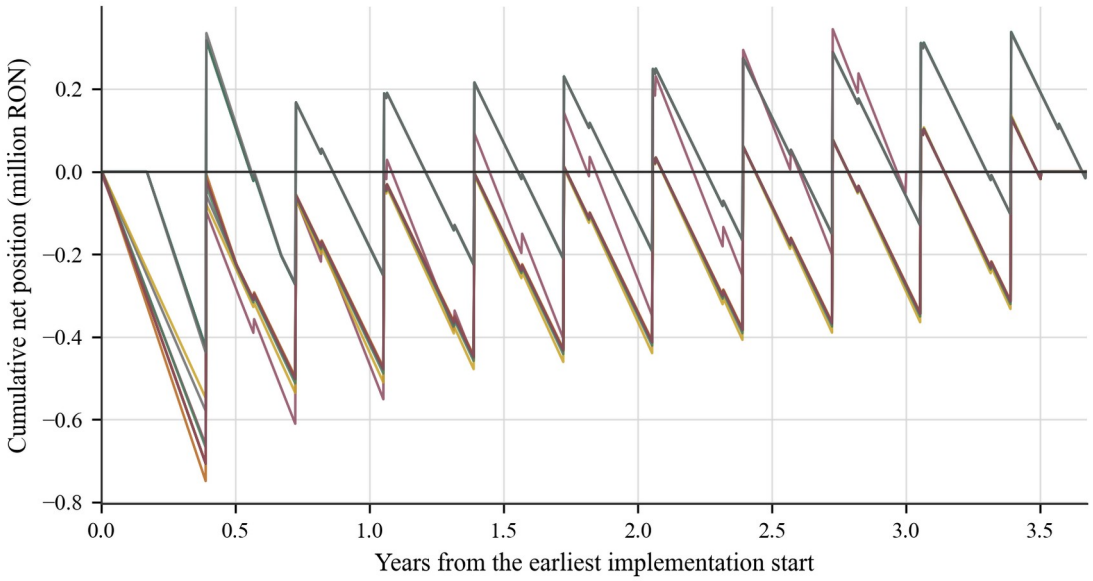


Figure 1. Cumulative net treasury position of the eleven projects on the contractual disbursement schedule, with no validation delay. Each line is one municipality.

Source: Author's own elaboration on the approved budgets and contractual disbursement schedules.

The deepest point is reached by every one of the eleven projects on the same calendar date, 19 September 2026, which is the day before the first prefinancing instalment falls due on 20 September 2026. That date is fixed by the call, not by the project. Measured from each project's own start of implementation, the same moment falls anywhere between day 79 and day 142, because the municipalities started at different dates while the instalment calendar did not move. The gap is therefore not an accumulation of small mismatches over three and a half years; it is opened in the first months, before any money has been received, and the rest of the schedule never fully closes it.

Table 1 reports the peak gap of each project on the contractual schedule, in RON and as a share of the eligible budget, together with the number of days in deficit and the simulation results discussed in the next subsection. The mean peak gap is 600 584 RON, or 12.14 per cent of the project budget, and it ranges from 424 701 RON (8.54 per cent) in M1 and M3 to 748 602 RON (15.05 per cent) in M2. The eleven project-level gaps sum to 6.61 million RON. Because all eleven minima fall on the same day, that sum is also the gap of the aggregated position: on a schedule in which nothing goes wrong, the eleven municipalities together must find 6.61 million RON from sources other than the grant on 19 September 2026.

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Table 1.
Financing gap on the contractual schedule and under simulated delays

Municipality	Peak gap, contractual schedule (RON)	As % of budget	Days below zero	Simulated median gap (RON)	Simulated 95th percentile (RON)	95th percentile as % of budget
M1	424 701	8.54	558	668 904	838 784	16.86
M2	748 602	15.05	1152	982 558	1 099 554	22.10
M3	424 701	8.54	558	663 595	833 475	16.75
M4	659 897	13.27	807	894 227	1 016 324	20.44
M5	578 685	12.10	1156	773 350	879 899	18.40
M6	547 592	11.03	1157	772 946	866 050	17.45
M7	706 484	14.27	1154	924 297	1 045 905	21.12
M8	705 142	14.27	1154	926 211	1 047 505	21.20
M9	667 293	13.42	1155	877 309	1 004 785	20.21
M10	705 925	14.27	1154	927 245	1 045 041	21.12
M11	437 405	8.81	555	683 445	864 148	17.40

Note: Simulation: 4 000 draws, delays independent across requests, normal with mean 45 and standard deviation 20 calendar days, truncated at zero. M1 and M3 have identical budgets and identical disbursement calendars, both built from the same template budget, and the model returns identical contractual gaps for the two; their simulated values differ only through sampling variation. The sum of the eleven simulated 95th percentiles is 10.54 million RON; the 95th percentile of the aggregated eleven-project position is 9.52 million RON (see Section 4.2).

Source: Author's own calculations.

Two features of Table 1 deserve comment before the simulation. The identical figures for M1 and M3 are not an error: the two municipalities submitted the same template budget with the same calendar, so the model, which knows nothing but the budget and the calendar, cannot tell them apart. The identical share of 14.27 per cent for M7, M8 and M10, whose gaps in RON differ slightly, is what the model produces when the calendar and the cost composition coincide and only the scale of the budget differs. Neither feature carries information about the municipalities; both are properties of the way the applications were prepared, and the companion paper on cost structure documents how far that preparation was shared (Almasan, 2026a).

4.2 The Waiting Period Explains the Cross-Section

The sample contains an internal test of the claim that the gap is opened by the interval before the first instalment. Because implementation start dates differ while the instalment date does not, the eleven municipalities wait different lengths of time for their first money: 80 days for the shortest group, which consists of M1, M3 and M11, and up to 143 days for the longest. If the waiting period is what opens the gap, the two quantities should move together across the eleven, and they do. The correlation between days waited and the gap as a share of budget is 0.896. The three municipalities in the short-wait group average a gap of 8.63 per cent of budget, against 13.46 per cent for the other eight. They are also the three whose position returns above zero for a sustained part of the project, spending between 555 and 558 days in deficit against more than 1 150 for the seven projects of full duration in

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the long-wait group; M4, with a 36-month duration and a correspondingly shorter horizon, spends 807 days below zero.

This is a weak test on eleven observations, and it is reported as corroboration rather than as identification. It nevertheless points in the same direction as the mechanism, and it rules out the alternative reading in which the gap is a matter of budget size or cost composition: the three short-wait municipalities have budgets in the same narrow range as the rest and a cost structure that the companion paper shows to be almost uniform across the eleven (Almasan, 2026a).

4.3 Delay Widens What the Design Opens

Figure 2 places the contractual gap and the simulated ninety-fifth percentile side by side for each municipality. Under the simulation the ninety-fifth percentile of the gap averages 19.37 per cent of budget, ranging from 16.75 per cent in M3 to 22.10 per cent in M2. The simulated median lies between the contractual gap and the ninety-fifth percentile in every project, as Table 1 shows, so the delay regime shifts the whole distribution upward rather than merely lengthening its tail.

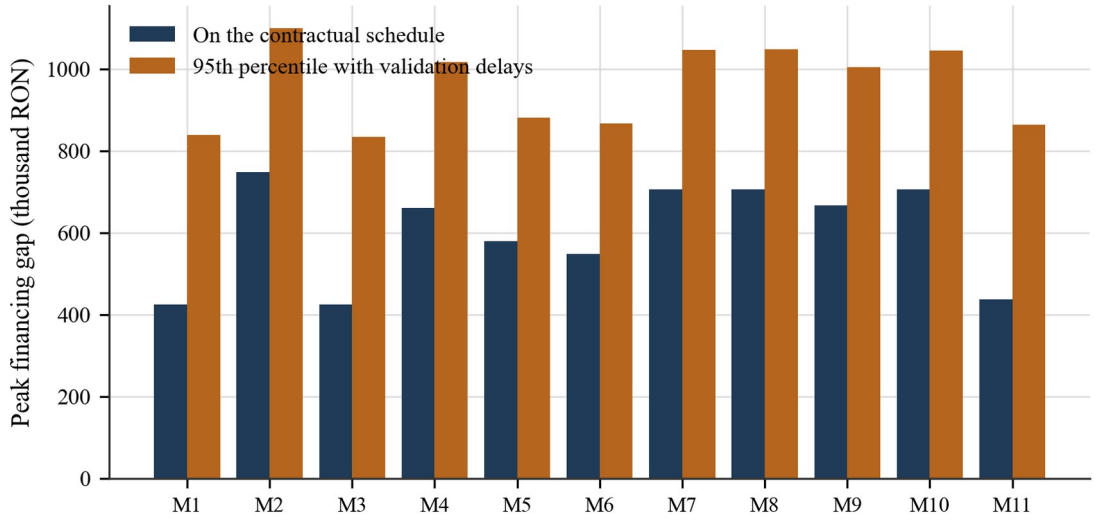


Figure 2. Peak financing gap by municipality, on the contractual schedule and at the ninety-fifth percentile of the simulated delay distribution.

Source: Author's own elaboration.

The two aggregate figures defined in Section 3.4 now diverge. The sum of the eleven project-level ninety-fifth percentiles in Table 1 is 10.54 million RON. The ninety-fifth percentile of the aggregated eleven-project position is 9.52 million RON. The difference of about one million RON, roughly a tenth of the sum, is a diversification effect: once delays are random, the eleven projects no longer reach their worst point on the same day, and the total that the eleven would have to find simultaneously is smaller than the total of what each would have to find at its own worst moment. The first figure is the right one for a municipality that wants to know its own exposure at the ninety-fifth percentile; the second is the right one for a managing authority or a county treasury that wants to know the exposure of the group. Both are reported, and they should not be confused.

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Across the eleven projects the ratio of the simulated ninety-fifth percentile to the contractual gap averages 1.63. A realistic delay regime, in other words, raises the requirement by roughly three fifths (a factor of 1.63) rather than creating it. The ratio is highest, at about 1.97, for the three short-wait municipalities M1, M3 and M11, whose contractual gap was smallest, and lowest, at 1.47, for M2, whose contractual gap was largest. Delay matters proportionally more where the calendar was kinder, which is what one would expect if the calendar and the delay were two separate sources of the same requirement.

Figure 3 turns to the deterministic sensitivity and traces the aggregate gap as a uniform delay applied to every request is raised from zero to 180 days. The response is close to linear, with a slightly steeper slope over the first quarter of the range than over the last. On the average slope across the full range, each additional day of uniform delay adds approximately 45 852 RON to the aggregate gap, which is Equation (4):

$$G_agg(d) \approx G_agg(0) + \beta \times d, \quad \beta \approx 45\,852 \text{ RON per day} \tag{4}$$



Figure 3. Aggregate financing gap of the eleven projects as a function of a uniform delay applied to every prefinancing and reimbursement request.

Source: Author's own elaboration.

On that slope, a uniform delay of ninety days rather than none raises the aggregate requirement from 6.61 to 10.74 million RON. The near-linearity is itself informative. It means that the gap responds to delay through the simple accumulation of expenditure during the waiting period, at the projects' combined daily burn rate, rather than through any interaction between instalments; the combined budget of 54.42 million RON spread over roughly three and a half years is of the order of 43 000 RON per day, and the slope is close to it. A managing authority that shortens verification by thirty days returns, on the same slope, about 1 375 560 RON of liquidity to these eleven municipalities. The calculation scales to any number of beneficiaries whose budgets and calendars are known, and it is the

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figure that the companion paper on preventive financial control uses to price each day spent in the control sequence (Almasan, 2026b).

5. DISCUSSION

5.1 The First Instalment Is the Design Problem

The results concentrate attention on a narrow point in the calendar. The deepest position occurs the day before the first prefinancing instalment, and that instalment date is set at the level of the call rather than of the project. The parameter that governs the size of the gap is therefore the interval between the start of implementation and that fixed date, which in these projects runs from 80 to 143 days. Everything else in the schedule, including the four-monthly rhythm of subsequent instalments, operates on a gap that is already open.

Three remedies follow, and they differ in cost. Advancing the first prefinancing request to the start of implementation would remove most of the gap at no cost to the fund, since the same money is disbursed either way and only its date moves. Increasing the size of the first instalment relative to later ones would achieve a similar effect at the price of a larger advance outstanding, and therefore of greater exposure for the managing authority should a project fail early. Shortening verification helps, but it helps linearly, at about 45 852 RON per day across the eleven, and it does so from a starting point that is already 6.61 million RON in deficit before a single day of delay has occurred. Of the three, it is the least efficient, and it is the one on which the absorption literature reviewed in Section 2 has spent most of its attention.

The point generalises beyond these eleven contracts. Under the current rules the managing authority is free to set the prefinancing calendar within the limits of the national ordinance (Government of Romania, 2021), and the Common Provisions Regulation constrains the delay between claim and payment but says nothing about the delay between implementation start and first advance (European Parliament & Council of the European Union, 2021b). The gap studied here lives in the space that the regulation leaves open.

5.2 What the Municipality Has to Do Meanwhile

A gap of the order of twelve per cent of project value on the contractual schedule, rising towards nineteen per cent under realistic delays, has to be covered from the municipality's own budget, from a treasury facility, or by slowing the project. The first option is closed for most rural communes, whose own revenues are small relative to a five million RON project and whose discretionary spending is a fraction of that. The second is constrained by the local public finance law, which limits the debt service that a local government may carry and subjects borrowing to prior authorisation (Parliament of Romania, 2006), and by the fact that local budgets are executed through the State Treasury rather than

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through commercial overdraft facilities (Lienert, 2009; Pattanayak & Fainboim, 2010). The third option requires no decision by anyone, and it is therefore the one that tends to be taken.

Delayed implementation then appears in monitoring reports as weak administrative capacity, and the literature that explains absorption by capacity (Milio, 2007; Surubaru, 2017; Incaltarau et al., 2020) supplies a ready interpretation. The interpretation is a misdiagnosis with a policy cost. It prompts training and technical assistance where a change to the disbursement calendar would have been the effective intervention, and it leaves the financial cause of slow implementation unaddressed because nobody in the reporting chain is measuring it. The Ninth Cohesion Report's finding that payment lags behind commitment most in the regions with the weakest local finances (European Commission, 2024) is consistent with either reading; only a model that starts from the contract can separate them.

Two consequences follow for the beneficiary's own control environment. The first is that the financing gap belongs on the municipality's risk register at the moment the contract is signed, not at the moment the treasury runs dry, and the internal audit function has the mandate to say so (Institute of Internal Auditors, 2024). The second is that the daily model is cheap to build from documents the municipality already holds, and it gives a figure, in RON and on a date, that can be put in front of the council and the county before implementation begins. The liquidity requirement is not a surprise waiting to happen; it is a number written into the contract in a form that nobody has added up.

5.3 The Three Papers and the One Dataset

The present paper is one of three built on the same eleven approved budgets, and it is useful to say how they fit together. The cost-structure paper shows that the eleven budgets were built from a template, with a personnel share around three fifths and an indirect cost line that is exactly 15 per cent of personnel in every case (Almasan, 2026a). That uniformity is what makes the cross-sectional test in Section 4.2 informative: with budgets and cost structures this similar, the variation in the gap across municipalities can only come from the calendar, and it does. The preventive control paper derives the operation stream that the same budgets imply and finds that the binding constraint on small municipalities is the availability of a second qualified person rather than the volume of operations; it prices each day added to the control sequence at the slope estimated here (Almasan, 2026b). The three analyses are complementary rather than overlapping. One describes what the money is spent on, one describes who must sign before it can be spent, and this one describes when it arrives relative to when it leaves.

6. CONCLUSIONS

Eleven Romanian rural municipalities that have contracted European-funded social service projects for 2026 to 2029 face a financing gap on the schedule written into their contracts, before any delay is assumed. The mean peak gap is 12.14 per cent of the project budget, or 600 584 RON, and the eleven

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gaps sum to 6.61 million RON, all of it falling due on 19 September 2026, the day before the first prefinancing instalment. Under a realistic delay regime the ninety-fifth percentile of the gap rises to 19.37 per cent of budget on average; the eleven project-level ninety-fifth percentiles sum to 10.54 million RON, and the ninety-fifth percentile of the aggregated position, which is lower because the peaks no longer coincide, is 9.52 million RON.

The gap opens in the interval between the start of implementation and the first prefinancing instalment. The instalment date is fixed by the call, the start dates are not, and the municipalities that wait longest carry the largest gaps, with a correlation of 0.896 between days waited and the gap as a share of budget. Verification delay adds to the aggregate gap at approximately 45 852 RON per day across the eleven, so that a uniform delay of ninety days raises the requirement from 6.61 to 10.74 million RON, but it does not create the requirement. The implication for programme design is specific and inexpensive to act on: moving the first prefinancing instalment to the start of implementation addresses the mechanism directly, costs the fund nothing in total disbursement, and would remove most of a liquidity requirement that small beneficiaries currently absorb by implementing more slowly than they planned.

Several limitations follow from the design of the exercise. The model uses contractual schedules and approved budgets, not executed cash flows, so it describes the projects as contracted rather than as implemented; the first instalment of the eleven falls due after this paper was written, and the model's central prediction, a common minimum on 19 September 2026, is one that the beneficiaries' treasury records will be able to confirm or refute within months. Expenditure is spread uniformly within cost categories, which is adequate for the cumulative position but not for the balance on any particular day. The delay distribution is assumed rather than estimated, which is why the deterministic sensitivity is reported alongside the simulation and why the central assumption is stated openly against the regulatory ceiling. Delays are drawn independently across requests, whereas a slow intermediate body produces delays that are correlated across the requests it handles; correlation would widen the upper tail of the simulated distribution, so the reported ninety-fifth percentiles are likely to be conservative. The eleven projects come from one call in one county and were prepared with common assistance, so the magnitudes are specific to that setting even though the mechanism is general.

Future work should proceed in three directions. The first is verification: repeating the analysis on the executed cash flows of the same eleven projects once the first reimbursement claims have been validated, which would replace the assumed delay distribution with an observed one and test the common-minimum prediction directly. The second is extension: applying the same daily model to the disbursement schedules of other calls and other beneficiary types, in particular to beneficiaries whose start dates are spread more widely relative to a fixed instalment calendar, where the mechanism predicts a wider dispersion of gaps. The third is design: estimating, for a managing authority, the

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exposure it would take on by advancing the first instalment to the start of implementation, so that the remedy the paper recommends can be weighed against its cost on the other side of the relationship.

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AUTHOR CONTRIBUTIONS

Conceptualisation, A.N.; methodology, A.N.; software, A.N.; formal analysis, A.N.; data curation, A.N.; writing, original draft, A.N.; writing, review and editing, A.N. The author has read and agreed to the published version of the manuscript.

DATA AVAILABILITY

The analysis uses the approved eligible budgets and the contractual disbursement schedules of eleven municipal projects, as filed in the national monitoring system for the 2021–2027 programming period. The same set of eleven approved project budgets is used in the two companion papers by Almasan (2026a, 2026b); the disbursement schedules are the additional input of the present paper. Municipality identities are withheld and results are reported in anonymised form. The daily treasury model, the simulation code and the anonymised event list of 252 dated requests are available from the author on reasonable request.

DECLARATION OF INTEREST

The author is a member of the academic staff of the publishing institution. The manuscript was handled by an independent editor and evaluated through the journal's double-blind peer review process. The budget documents and disbursement schedules analysed were obtained through the author's advisory work with the beneficiary municipalities, with their consent, and the municipalities are not named. The author declares no other competing interests.

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