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On Unaffordable Regional Infrastructure

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On Unaffordable Regional Infrastructure

Abstract

Modern societies have failed to find affordable ways to fund needed infrastructure. Problems have multiplied from ignoring the particular characteristics of infrastructure and assuming the adequacy of the conventional finance of recent times, be this publicly or privately sourced. These failures, compounded by insensitive monetary stances, have led to a lingering economic and financial malaise, one particularly evident in some regions. Such failures have also contributed to the parlous position of many governments and the current global crisis. Infrastructure affordability is a central theme in this paper. Affordability, investment and credit are explored using simple numerical illustrations to highlight important aspects of probably the most pervasive means of finance, debt. Interest rate and other movements over decades can generate significant variations in yields realised from investments. Conditions over recent decades appear to have made debt-financed infrastructure more unaffordable than any time in the century since the States of Australia federated. It is little wonder that all States are currently struggling with infrastructure provision. A new era may be emerging from current crises but its eventual success, or otherwise, will reflect how well (un-)affordability is addressed. Prospective yields on investments need to be sufficiently realisable. Recognition and accommodation of the peculiarities of various forms of investment will be part of any adequate new foundations. The “infrastructure (un-)affordability problem” needs to be much better appreciated, understood and accommodated, by private and public parties alike.

Keywords

Infrastructure, Affordability, Region, Debt, Monetary Policy

Cover Page Footnote

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Introduction

Infrastructure investment is distinctly different from many other forms of investment. It is located, regionally specific and highly embedded in place and time. While durable, it requires maintenance and incremental improvement as changing demands and technologies are likely over its life. Infrastructure persists as do the consequences of investment. Many of these properties of infrastructure are contrary to those commonly assumed in economics and finance.

Funding is always an issue. Typically, large initial expenditures are made on non-relocatable assets with efficient capacity utilisation taking years or decades. Patient capital and long-term finance across several business cycles are needed – yet these have been discouraged by current short-term arrangements. The short-term basis of many funding arrangements sits poorly with the long-term nature of the infrastructure and its impacts. Indeed, mismatches in arrangements can raise risks and make infrastructure unaffordable.

All infrastructure investments face long lead and repayment times for something that is foundational for industry, regional and community development. Failure to recognise this has added to debt burdens around the world. Sovereign debt problems have risen when income expectations went unmet while obligations on governments remained. Australia, despite current appearances, is not immune from ongoing threats.

It is time for the full nature of infrastructure investment to be recognised and accommodated. Prudent investments in infrastructure would appreciate that:

- Affordability needs to be estimated under a range of scenarios and established across specific situations, not generalised assumptions.
- Infrastructure is regionally embedded, not nationally present, so suitable regional and industry impact analyses are part of any adequate evaluation.
- Infrastructure while potentially enabling in a region also can obligate those in a region, sometimes in unappreciated ways.
- Infrastructure provision and maintenance need a sound base with clear, robust analyses of contributions and their allocations, particularly if debt financing is envisaged.
- The impacts of infrastructure investment are pervasive. They can spread across and change regions, involved entities and the times.
- Financial regimes and monetary arrangements need review and renewal, especially where they needlessly raise risks and costs while reducing competitiveness, yields and viability.

- Current tendencies to take needless investment risks with implications well beyond current times of heightened uncertainty need to be curtailed.

Affordable infrastructure can help create true progress with better regional and national futures. Less-affordable infrastructure involves a higher cost with opportunities foregone. Unaffordable infrastructure impoverishes contributors, regions and the wider public. It also imperils the solvency of associated parties, including industry or community enterprises, various levels of government, banks, financing systems and potentially the State itself.

Issues of Positioning

Alternate Answers to an Infrastructure Question

We begin with a question which arises from reading Sturm (1998): *Why across the OECD did infrastructure spending decline in the 1970s and subsequently while governments ran deficits?*

An immediate answer is obvious: that discretionary capital works are relatively easy to reduce in times of tight finances. An alternative answer might be that infrastructure needs were (seen as) largely met with other priorities accorded greater importance.

Reflect, however, that across the OECD:

- Government deficits have generally continued, even when assets have been sold. Public debt reductions, if any, have often been transient;
- Infrastructure needs are generally recognised as unmet, despite all manner of innovative arrangements in their provision; and
- Economic growth and productivity increases have often been disappointing.

It seems sensible to consider alternative answers and the possibility of contrary and inhibiting influences in the policy environment and broad socio-economic settings.

The alternate answer explored in this paper is *that infrastructure became less affordable under the arrangements that emerged in the 1970s and 1980s*. Apt resolution of underlying infrastructure shortfalls and other problems will require new arrangements, including in macroeconomic positioning. Monetary policy in particular needs recasting. More adequate regional considerations and initiatives are sensibly part of achieving such changes.

Infrastructure is literally something below, beneath or within a structure. Items of infrastructure each contribute towards some ‘greater’ structure and the activities it supports. Used collectively, infrastructure is a collection of parts that comprise some structured, long-lasting whole. Infrastructure persists, as do the impacts of its provision.

Adding to infrastructure changes the effective combination of various structures. It adds creative possibility. Some new or better ‘ways of doing’ come into being *as a result of* the improved structures put in place and into places. While many consider efficiency improvements as a hallmark, the impacts of new infrastructure are wider. Provision changes what is achievable in some region(s) as various impacts pervade and change the region(s). Explicit developmental, regional and like considerations are needed in any adequate consideration of infrastructure and its impacts.

If this argument is accepted, then inadequacies in infrastructure provision have not only inhibited *the amount* of achievements (measured quantitatively in terms of economic growth, profitability or efficiency) but also *the mode and quality* of achievements. ‘How’ and ‘how well’ things are done depends, at least in part, on the accessible infrastructures present. Relationships between regional achievements, accessible infrastructure and investment affordability are important in many ways, and to many entities.

Positioning Infrastructure Investment

Infrastructure investments involve a mix of entities engaging to deliver some extensive regional capacity. Extensiveness may be across:

- Time
- Space
- Resources
- People
- Interests

All aspects are intermixed in various ways in any infrastructure proposal. Embedded with the development of any infrastructure are the planned and realised physical creation, related investment decisions, funding arrangements and the decision makers themselves.

- *Infrastructure itself* will be embedded in a place or places (‘hard’ infrastructure), in durable institutionalised arrangements (‘firm’) or

persons ('soft'). Infrastructure *developments* are typically made with limited (if any) physical, organisational and financial reversibility.

- *Those making investments* are themselves embedded in many ways. *Decisions* occur at some historical time when certain beliefs, perceptions, ideas and conventions will be widely accepted and variously reinforced by individual or group experiences.¹
- *The funding of the investment* will involve some *arrangement* of monies and obligations across time. Expected flows may or may not eventuate, for all manner of reason or circumstance.

Together these constitute an investment event. Neglecting this three-fold connectedness and embeddedness can lead to problems, notably with repayments and regional prospects.

Infrastructure investments present in some ways, an extreme form of investment as they involve:

- Assets with an expected very long life cycle;
- A mix of parties committing selves and resources for often very lengthy periods of time (during which much might happen);
- An immobility in the constructed physical asset (specifically for hard infrastructure) and attendant maintenance liabilities;
- High initial expenses and, typically, much delayed returns;
- A varied ability to identify and charge users of the asset; and
- A varied ability to identify and charge beneficiaries and to compensate contributors.

Such things make funding of infrastructure particularly problematic. The nature of infrastructure impacts and their analysis in various contexts are key issues, and are discussed in the following section. These impacts influence the affordability of development, and the ability of developers to attract investment and credit. These issues are further examined in the section titled, 'On Affordability, Investment and Credit'. This article then explores issues with repayment, before finally examining issues associated with changing interest rates and debt-financing scenarios.

¹ Even if it was possible to disentangle from all such influences, it is impossible to be objectively informed when the consequences of a decision can last decades into an unknown future. Influences such as the interest rate will change unpredictably with the passage of time and circumstance.

Infrastructure Investment Impacts in Context

Each infrastructure investment can be analysed in its own right and as an addition to ‘what was before’. A project, its context and interrelations past, present and future can all be important.

- *Individually, each investment needs to achieve a positive balance, or a net contribution.* While this is usually accounted for in terms of money (with a “positive money balance” sought), the nature and extent of contributions from an infrastructure investment are normally much wider. Impacts affect persons, places and ‘the times’ in many ways.
- *Cumulatively over times, persons and places, such investments build a web of extensions and engagements.* Such a web may foster considerable gains, not just for those directly involved but also for those indirectly affected or distantly located. Infrastructure investment engenders changes in the affected times, persons and places. Impacts are not ‘once off’ nor ‘solely here’.

The idea of a suitable net contribution underlies ‘affordability’ (as will be discussed in the following section). First, however, the influences and potential importance of contexts are addressed. Significant effects can be introduced, or avoided, through choices of context(s) and of perspectives as cast within the chosen context(s).

Setting a “Time” Context and Perspective

Infrastructure persists *across time* while investments occur *at some times*. Investment involves allocated capitals with attendant expectations and obligations embedded *in time*. New infrastructure investments do not exist in a vacuum but rather in relevant contexts including:

- **event contexts**, typically cast in a before, during and after ‘*some time*’ sequence. Past, present and future are composed, perhaps in terms of ‘what is already there’, ‘what is now envisaged’ and ‘what might be’. This broader context underpins a number of the considerations offered in this Paper.
- **locational contexts**, typically in terms of a network, system or region *as host* perspective. Infrastructure-host engagements and (co-)contributions variously develop *in time and situation*, as is discussed in the remainder of this section.

- **flows contexts**, occur typically in terms of costs, returns, risks and/or obligations *over time*. These may be variously assumed to transcend times, places and other contexts. Selected obligations and benefits are *then assumed* to persist *irrespective of time or circumstance*. Alternately, some interrelations may be addressed in context with choices of perspectives and specific interactions conditioning the findings. Considerations of debt as free of context (Section 4) and in an historical interest rate context (Section 5) demonstrate the significant problems that can arise when context is neglected.

Each of these context types (or styles) can be used to assess infrastructure investment, singularly or in combination. Analysis and the adequacy of evaluations are conditioned by choices made. Ideally, examinations of each context would play a role in evaluations, with contributed insights suitably articulated and reconciled. Practically, this is exceptional.

There is *a further context* indicated in the use of ‘variously’, *that of distribution*. Various interests and associated responsible entities are involved in, and impacted by, infrastructure investments. Interests are commonly classed as private, public, community and the like with responsibilities assumed by government, private, sectoral or other agencies.

Costs, benefits, risks, imposts, obligations and other effects are generally not uniformly spread, nor should we expect them to be narrowly focussed given the breadth of infrastructure impacts. Such things comprise the **distributional context**. As history demonstrates (including in Public Private Partnership experiences), provision may be attempted by some, any or all agencies with a variety of results across disparate interests and entities.

Considerations of the distributional and event contexts, though important, lie beyond this paper. Rather, the focus is on the positioning of infrastructure investment and impacts. Locational contexts are briefly examined in the remainder of this section. Flows contexts are central to considerations of affordability, repayment and debt servicing.

A Network or System Perspective on Functionally-Linked Host Locations

Networks² and systems³ occur when 'parts' work together as functioning elements in some (actual or imputed) whole. Cumulative developments of functional interdependencies underlie both, and both rest in some shared structure. While use of 'network' emphasises connectedness and 'system' some overall capability, each presumes gains from association and the achievement of enhanced outcomes.

There is a gain from 'being together'. 'The whole' (system or network) somehow exceeds the sum of the parts, and the contributions of a new part emerge in this context.⁴ Impacts are typically analysed quantitatively, but changed qualities, new outputs and differently achieved outcome mixes may all occur after investment. 'More', 'better', 'new' and 'different' are all possible qualifiers.

For example, adding or improving a transport link uses an identifiable mix of resources to deliver a new linkage capacity that can complement, augment and substitute for pre-existing links and capabilities. Such network and system investments create new possibilities. For instance, an enhanced ability to move products or people allows exploitation of "distantly sited" resources.

A road, rail, air or other transport *network* provides *links* to move goods and people between places (or across a region). The benefits of a network are partly in its use (things can be and are physically moved) and partly in enhanced efficiency, reliability and surpluses accruing to those directly involved and to affected others, including the wider society. A mineral deposit is nothing without a link to a port, and the quality of the link affects the profitability of both mine and port.

In a complementary way, *system capabilities* reflect the various actions and interactions of elements. The *outputs* of functioning systems (with their subsumed infrastructures) enable wider functioning to be achieved. A mineral deposit is nothing without a transport service, and service quality affects the profitability of mine, system and port.

² Network approaches to regional development include works such as: (Amin & Thrift, 1992; Chung, Yam, & Chan, 2004; Fornahl & Brenner, 2003.; Lomax, 1969; Murdoch, 2000; Simmie, 1997).

³ Amongst many references using systems are: (Stohr, 1974; Taylor, Papps, Milton, Local Government Development Program (Australia), & Australia. Office of Local Government., 1992; Tornqvist, 1970).

⁴ Such issues are well discussed in (von Bertalanffy, 1973) . Conditions of separability and additivity that are assumed in determinate classical analysis do not apply in systems analysis. Both system and network are not fully decomposable. Each is more than the sum of its parts.

Network and system *outputs assist* entity *outcomes* directly and indirectly. Simple attributions of cause, effect and the values of various contributions will be deficient since the outcomes for each depend on *the effective mix* of contributions from each and all. Naive solutions which ignore such things may then fail.

A Co-Location Perspective in a Host Region Context

Infrastructure investments are located in host regions characterised by variously co-located activities, establishments and places. ‘Together in the region’ captures both functional diversity and the scope of activities which may be concentrated within the region or spread inter-regionally. Intra- and inter-regional impacts variously accompany an infrastructure investment.

Returning to the example discussed previously, a transport link enables movement to and from the region, but it is consequent patterns of location that embed the regional spread of impacts. Existing service providers in established centres may now be able to extend their reach further, for example; better air links improve both freight services and fly-in fly-out possibilities from distant centres. Consolidation of some activities away from the previously unlinked centre or region may occur, or it may now be feasible to provide new services. The balances struck fashion development.

Transport investments can catalyse other investments and developments. *Outcomes* can build cumulatively, assisted by cycles of positive feedback. Associated investments are made with some expectations of link performance in mind, and the ongoing viability of such investments may be dependent, to a greater or lesser extent, on the ongoing functioning of the transport network. Regional systems emerge that capture and codify enhanced capabilities. Transport infrastructure is a necessary precondition for development beyond the rudimentary stages of an economy.

Infrastructure impacts occur not only in routine ways but also *via* ‘enhanced’ physical, economic and societal possibilities. The host region will experience some impacts (variously termed as costs, benefits, risks and the like) while impacts can also affect other regions. Investment impacts *variously spread regionally* ‘*somehow*’. Locations and location decisions matter. The locations of those funding, building, using and benefitting from the investment may differ markedly yet it is the host region and its various places that are physically impacted. Clearly sensible balances need to be struck if the whole investment is to be worthwhile for the various entities and regions involved.

Taken Together

Infrastructure investments variously expedite different outcomes for those directly and indirectly impacted. Various outputs collectively support multiple outcomes. Impacts are embedded in a region, enabling of activities in and beyond the region and extractable as payments from the region (directly or via arrangements within a multiple-location enterprise).

Such possibilities point to a need to centre analysis on the development and balances of payments of the involved entities.

- Suitable analysis of embedded contributions from infrastructure investment provides an important cross-check on claims of economic and other gains from projects. Network, system and regional analyses are relevant in addressing how it can contribute to issues.
- Appropriate balances in payments quantitatively underwrite affordability. Size, direction, nature and timing of flows are central. Any analysis of how much may it contribute when, will make assumptions as to what flows are important and likely, an especially challenging task with infrastructure.

Whatever the mode and focus of an analysis, all such works involve selective considerations of alternate manifestations of the same constructive ‘working together’ *via infrastructure* of persons, places and time. *Complex interplays occur, so simple cause and effect relations are unlikely.* Consequently, simple ‘solutions’ may fail as would overly simplified or restricted analysis.

Infra-structures (hard, firm and soft across regions, systems and networks), resource endowments, capacity and current functioning or the perceived capabilities of a region and its people may all be part of the story. Each may be diminished by investments made ‘inappropriate’ through actually realised impacts. Particular care is needed with simple quantitative analyses.

Getting such balances ‘about right’ should lie at the heart of feasibility analysis. While combining the various types of analysis discussed is both a practical and a conceptual challenge, it appears a necessary step in the development of more adequate infrastructure dialogues and prudent investment decisions.

On Affordability, Investment and Credit

Investment involves preferentially allocating resources to some durable bundle which can generate returns over time. Commitments are made because we believe that adequate returns will eventuate. Investment decisions ride upon a balance of beliefs and a raft of expectations.

Such a position motivates savings and underwrites investments. Something somehow better is expected later. Peoples' beliefs and expectations matter, along with their animal spirits or spontaneous optimism rather than mathematical expectations (Keynes, 1936).⁵

There is also a deferral of the use of some resource (by one party in favour of its later self or some other). There is anticipation of greater returns over time (with return flows from the using party back to the deferring party). Essentially, the process is one of delayed gratification, the psychological term for waiting for what one wants.

To function effectively, individuals must voluntarily postpone immediate gratification and persist in goal-directed behaviour for the sake of later outcomes (Mischel, Shoda, & Rodriguez, 1989).

Time, aspirations and commitment are central to an investment. There is some period during which the invested resource is not returnable either as was or *via* a stream of acceptable returns. There are also expectations, however founded, that there will be, in the fullness of time, a sufficient return, however expressed, to make the investment worthwhile. However, it is *realisations that actually deliver*, whatever the expectations and underlying beliefs might have been.

An investment is affordable if a surplus (however cast) can, and does eventuate, however this is distributed. All costs can be, and are met. Due payments can be, and are made. Both a possible and a practical realisation are needed, the former to allow sensible entry into some arrangement (such as a contract) and the latter for its (happy?) dissolution.

Clearly, the situation is one of multiple entities bound over some times. Normally, at least two entities are involved, the provider of the invested resource

⁵ Note that the explicit inclusion of time renders as problematic any idealised static and comparative static analysis, such as those used in neoclassical market analysis where there is neither time nor commitment over time for 'producers' and 'consumers'. 'Savers' and 'Investors' are essentially absent in such analysis, as are intermediaries.

and the user. The embeddedness of infrastructure signals a need to additionally consider the interests of the host via whatever entity is deemed appropriate. Other beneficiaries and intermediaries may also be involved. The situation is a joint one with various interests merged in some ways with significant interdependencies persisting over time. Balances of payments can capture the mix of contributions, risks and returns. Ultimately, there need to be (singly and mutually) acceptable allocations and balances across the life of the arrangement.

Initially, anticipated balances may be unmet for a variety of reasons. A repayment problem may then arise. Any persistent imbalance affecting those directly involved is the basis of internal crisis. Mutually and/or individually expected outcomes are threatened, typically by some deficient outputs. Now-feasible allocations will differ from those expected. Some renegotiation may be appropriate, or it may not be. Dissolution or default may be considered by one or other of the internal entities.

Problems compound if some entity on-sells expected outputs. The basis of securitisation⁶ is the packaging of expected outputs from some activity into promised income streams for investors. Risks rise when income streams are presumed as certain, and then rated as such. External crises arise when realisations are significantly less than expectations for those external to the core event.

Three temporal perspectives on an investment event for core or external entities are relevant:

- *Ex ante.* Refers to the period before the event, when the initial undertakings are made, and arrangements are agreed and set in place. **Expectations are drawn** together here, *at this (preparatory) time.*
- *In situ.* This term refers to the life of the arrangement during which various agreed obligations are to be met. Though the term literally means unaltered, adjustments may be made if eventualities differ markedly from expectations. Various **balances accrue here**, *over these times*, as the investment engages the economy.
- *Ex post.* This term refers to the end period when the arrangements are dissolved and parties can evaluate their final positions. **Realisations are finalised** here, *after some (anticipated or early end) time.*

These three perspectives focus on the stages of an event, *before, during and after.* Taken together, they can encompass an investment event. Infrastructure stands out because of the length and uncertainty of the times when investment remains in

⁶ Securitisation largely drove the global financial boom, bust and crisis.

situ. Acceptable balances need to be maintained across such times for all the various critically-involved entities, a group distribution problem.

How balances might accrue in situ and to a realisation stage is considered next. A simple numerical example of a debt-funded investment is cast as a flows problem essentially free of temporal context (Section 4) and variously embedded in historical time (Section 5). Considerations of distribution issues are left to another place.

Empirical Illustration of the Repayment Problem

Obligations for a debt-funded investment are chiefly payment of interest and repayment of principal. Among potential benefits are a revenue stream arising from the rewarding economic activity now enabled. The extent to which enabled revenue streams can be captured by infrastructure investors⁷ is an open question, but a secondary one here. The key question in this analysis is, under what conditions may returns from an infrastructure investment be adequate overall?

The simple illustration provided here involves debt financing over thirty years for infrastructure initially valued (costed) at \$1000. This could be associated with all manner of long-term investments by private, public or other entities. Obviously, the units could be scaled up, to thousands or millions say.

Annual revenues begin at 2 per cent of the initial investment, rise over the mid period and then level off at a generous 20 per cent p/a on the initial investment. Funding costs for three different interest rates are shown: 2 per cent, 4 per cent and 6 per cent p/a compounding. The investment would then be repaid in years 20, 23 and 29 respectively with maximum debt exposures of 1.00, 1.28 and 1.72 times the initial investment.

⁷ Be these public, private or some mix thereof.

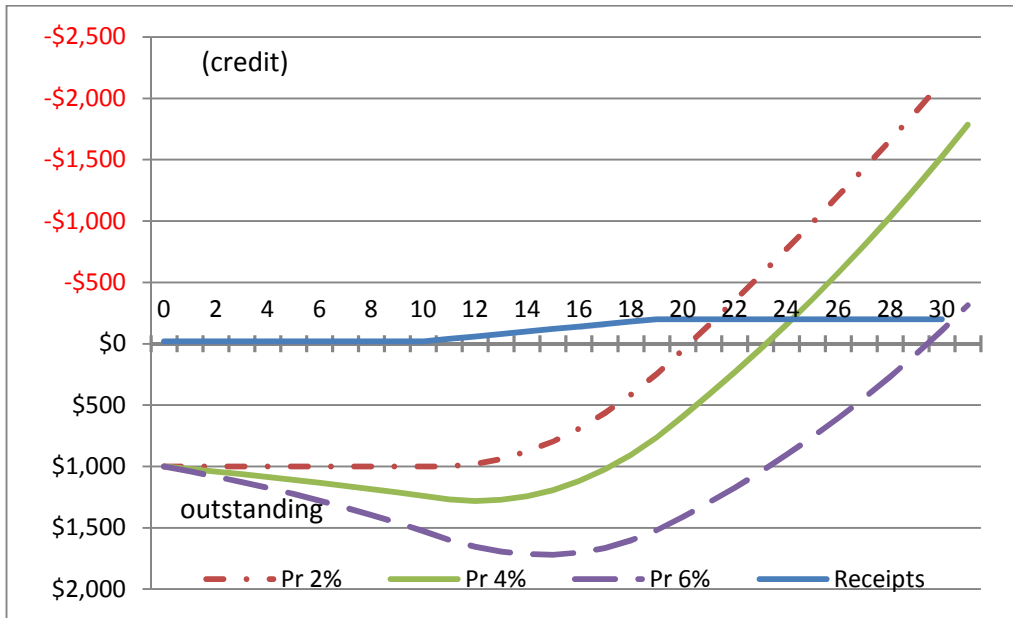


Figure 1: Illustrative cash borrowing position, with delayed receipts from investment funded at different (real) rates

Note: The situation is a relatively optimistic one in terms of revenues in that receipts after the initial period of \$20 p/a for years 0 to 10 build quickly by \$20 p/a until they level off at \$200 from years 19 to 30. It is assumed that the same interest rate applies to debts and deposits.

Alternately, consider a constant 5 per cent (or \$50) annual receipt over the life of the project. The results are shown in Figure 2. While this is sufficient to repay the borrowing at 2 per cent p/a in year 25, at year 30 an amount of \$440 remains outstanding for a 4 per cent rate and \$1791 for a 6 per cent rate.

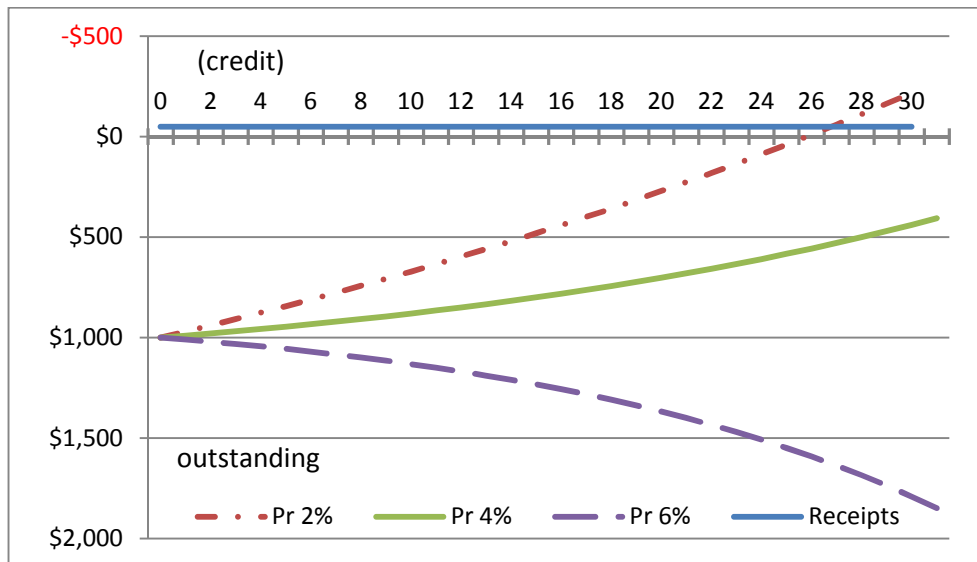


Figure 2: Illustrative cash borrowing position, with constant receipts from investment funded at different (real) rates

Two simple lessons can be drawn from this analysis:

- Delayed revenue schemes are particularly vulnerable to higher interest rates. Such a situation may apply where installed infrastructure capacity initially exceeds demands with full capacity utilisation not reached for some years.
- Slow and steady revenue approaches lose out markedly once interest rates exceed the revenue rate (here 5 per cent). Additionally, principal repayments take decades even with a several percent differential between revenue and borrowing rates.

Obviously further examples can be given and more sophisticated analysis can be employed. However, these simple examples do highlight key basic considerations in debt servicing.

Arguably, such patterns are generally well known but little applied. All manner of arguments and assumptions can be advanced to blur the mathematical drivers. Two popular ones have been:

- Asset values are rising so I can always profitably liquidate my position.
- Inflation means that my ability to service the loan improves as my revenue stream will rise with inflation but repayments will not.

At times, such arguments may, and will, hold true. At other times, they will not. Reliance upon contingencies always involves some risks. Situations can be compromised when the contingent argument is assumed universal. Whatever the arguments, ongoing obligations exist and mathematics quantifies the loads.

Changing Interest Rate Contexts and Debt-Financing Scenarios

Successful debt financing requires that expectations be sufficiently met so that returns exceed costs across the life of the arrangement. Given the formal, legal nature of undertakings made as contracted debts in the Western tradition, the debtor can be held fully responsible for any failure to meet liabilities. Potentially, this may be not just for any failure of expectations on his or her part but also possibly those of the lender. Risks are then considerable, so a considerable part of the development of Western business has been centred on the limiting or quarantining of debt-associated liabilities. Insurance and the limited liability company are just two of many examples.

Developments in monetary policy and its governing institutions since the breakdown of the Bretton Woods system in the early 1970s have complicated matters in ways that are only now being appreciated. Full discussion must be left to another place but important issues that need to be addressed include:

- failures to expunge unrepayable debts;
- a lack of effective or appropriate discrimination between borrowers with different risk and return profiles;
- the trend towards short term financing and increasing reliance on refinancing;
- the roles, arrangements and varied successes of various public and private providers across a range of nations;⁸
- conditions, if any, under which interest rates across an economy can be sustainably or sensibly above GDP growth rates;

⁸ The emphasis in this paper is on the nature of problems faced by both public and private providers. Issues associated with debt financing are common. Privatisations, public private partnerships (PPPs) and private finance initiatives (PFI) have been popular since the 1980s but results have been very mixed. Since the beginning of the Global Financial Crisis, nationalisations and public guarantees have been used, extensively by some nations. The observation that neither private nor public parties are assured of success (despite various promotional claims) was one of the things that lead to the wider considerations of the importance of contexts in realising affordability as discussed in this paper.

- ways by which current global imbalances developed and future ones might be avoided;
- institutional performance, with several central banks and many private banks showing unduly poor records;
- whether banks which have made, and can continue to make, serious errors at the expense of others constitute a peculiar source of moral hazard;
- whether market concentration and sectoral coordination have moved beyond optimal levels; and
- the implications of currently emerging regulatory and policy stances, nationally and internationally.

A borrower today faces not just the usual uncertainties of business and life but also the unknowns of a faltering financial system, demonstrated inadequacies in regulation and policy, and in unfolding crises. While opportunities will be present for some, others are being impoverished and debilitated.

Investigating questions of ‘to where might we go?’ deserves greater priority. Specifically, we consider ‘to where might borrowers go?’ using the earlier illustrative examples and allowing for situation of variable interest rates. Rates can be volatile as demonstrated for last century in Figure 3 in which Australian five-year average **real** interest rates are shown. Clearly, borrowing occurred with some very different real interest costs across the century. For borrowing over 30 years or so, six average rate settings (or graphical bars) could impact.

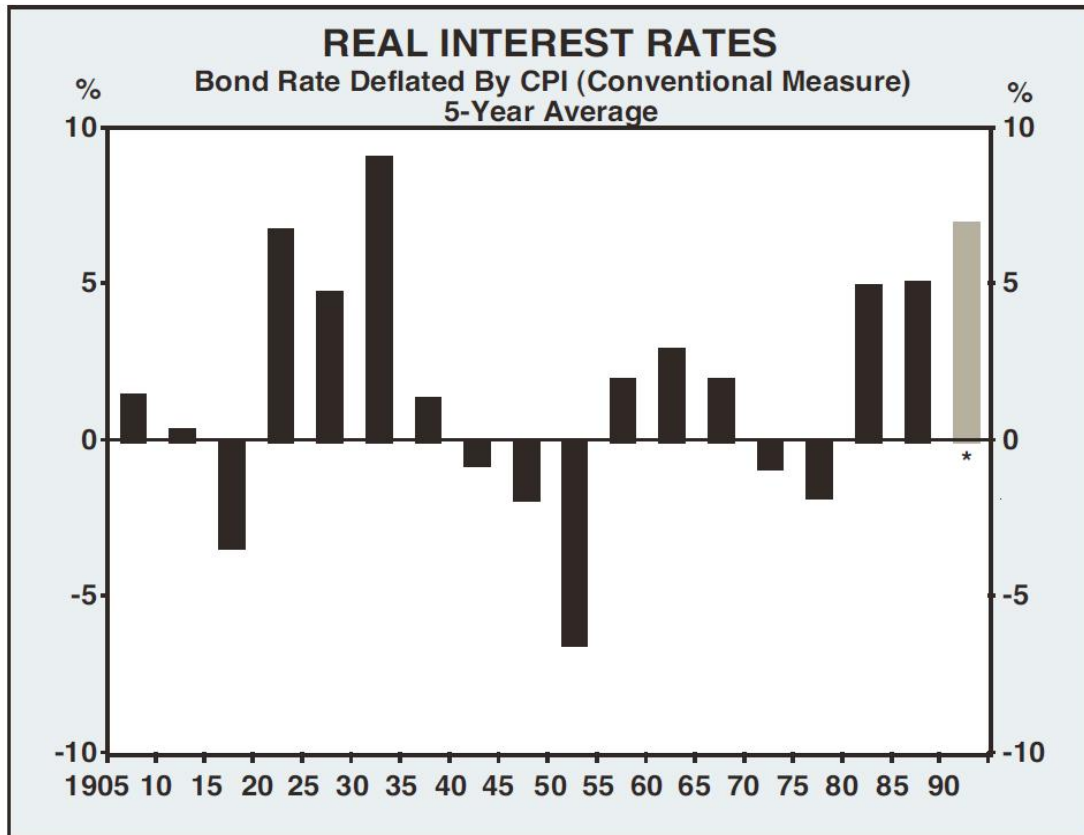


Figure 3: Real Interest Rates - The Australian Historical Experiences

Source: (Fraser, 1991)

The borrower in 1905 initially had a good run (presuming no asset destruction or earnings diminution during World War 1) but was then caught (or assisted if in credit) by the highest real interest rates in the latter half of his loan. The 1935 borrower had the best real interest rate run. Those excited by the mining boom in the late 1970s and early 1980s faced stiff interest rates up front (and failing commodity prices in the 1990s) as this boom turned to bust and stocks to dust while plans were shredded.

The volatility of real rates across the years are clearly illustrated. In addition, this dated set has been chosen to highlight the limited nature of both such information and of embedded decision making. A 1980 investment might only now be maturing - and if you had been an analyst using Figure 3 in 1992 what might your interest rate expectations and project assessment then have been?

A fuller set of real interest rates for Australia has been developed from Fraser (1991) and RBA (2010). Rates have been read directly from graphs since adequate original data is surprisingly difficult to locate. While rates are only working estimates to the nearest whole percent, the findings are relatively insensitive to variations of a percent or so. Patterns appear robust and sufficient for purposes of illustration and discussion until more adequate series are obtained.

Initial borrowing and revenues over the thirty years are the same for the five cohorts plotted in Figure 4. It is the six five-year interest rate blocks that vary. All are in real terms allowing direct comparisons.

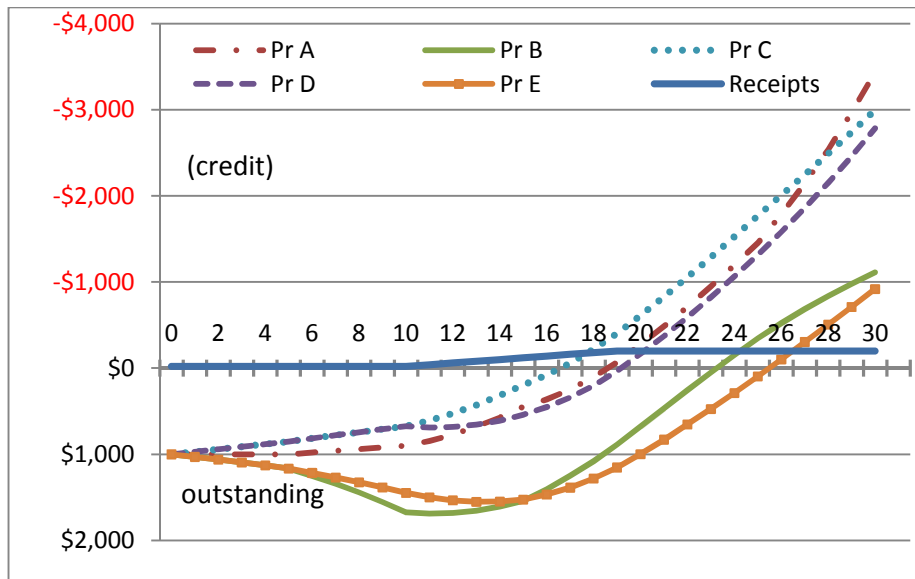


Figure 4: Illustrative cash borrowing position, with delayed receipts from investment funded at alternate historical (real) Australian interest rates

Note: The same interest rate is both charged on debits and allocated on credits. No margins for various classes of borrower have been added. All dollar values are in real terms.

Observations include:

- Three cohorts A, C, D show a similar pattern with debt repaid in 17 (for C) to 20 years and a final principal position of around \$3,000 credit after 30 years. That is, \$1,000 initially borrowed to invest in the same revenue

source resulted after three decades in all debt repaid and a similar final credit when the commencement years were 1905, 1940 and 1970. The initial principal borrowing of \$1,000 was the maximum exposure for all three cohorts.

- Cohorts B and E are markedly worse. Both see the initial borrowing extended further, to debts of \$1,687 in Year 11 for B and \$1,551 in year 15 for E. B and E were cash-flow negative for 11 and 13 years respectively. Marked deteriorations were in years 6 to 10 and it is then that terminations might be canvassed.
- It is not until Years 19 and 21 that the initial position is first bettered for B and E. Repayment is not until years 23 and 26 respectively. After three decades the final credit positions are \$1,230 and \$919. Both B and E involve the same revenue stream but interest rate conditions over the life of the investment enact poor performances.
- Cohort B commenced in 1925 and was affected by years of depression and war. Cohort E which commenced in 1980 and completes during this year was affected by years of growth and modern monetary policies.

The last thirty years saw the worst performance for our simple illustrative debt-financed investment.

Aggregate interest paid (or received if negative) over the thirty years varied markedly, as shown in the panel. The 1905 investment (A) would *receive* an interest credit of \$1,136 while the modern E investor *pays* \$1,381 to the lender. The example uses the bond rate with no bank margins, spreads and the like. Actual borrowers, beyond governments, would pay at a rate something more and receive from a rate something less so their outcomes would be less favourable.

	A	B	C	D	E
Commenced	1905	1925	1940	1970	1980
Net Interest paid	-\$ 1,136	\$ 1,189	-\$ 696	-\$ 485	\$ 1,381

Such has been the real experience for bond-rate borrowers in Australia over the last century. Other borrowers faced more adverse conditions than governments in debt financing their investment.⁹ Such borrowers include businesses small and large, government corporations, most house buyers, many students and most entities needing money for long-term investments.

⁹ Private borrowers face higher rates, which they may seek to offset by obtaining government guarantees or by raising equity capital to reduce the borrowed principal.

Recall that the simulated investment has very low early returns but high annual returns of twenty percent on initial borrowing in later years. Such a revenue pattern is typical of investments with long lead times such as income-earning infrastructure, research with potential for commercialisation or major revenue-generating development projects. Later year returns may or may not be 20 per cent, of course.

A naive indicator of returns over the life of the investment is the balance improvement divided by revenues. Annualised over thirty years the naive returns are 4.5 per cent, 2.1 per cent, 4.0 per cent, 3.8 per cent and 1.9 per cent per annum for A to E. Such instability in returns for the same investment indicates the importance of contexts and the marked influence of interest rates on realisations from investments made.

While these results are intriguing and suggestive of much more, this work uses only a simple empirical analysis. More adequate data series and further analyses are needed to confirm and refine these findings and to relate them to complementary works. Comparatively little research has been conducted into real interest rates and their effects in Australia and more needs to be done in this field. However, there are some interesting studies, including research by Felmingham and Mansfield (1999) and Corden (2008), which have important conclusions.

Real interest rates in Australia from 1975 to 1997 were volatile. Using detailed econometric analysis Felmingham and Mansfield concluded that real interest rates were subject to structural shifts with attendant considerable uncertainty as to the real return on investments.

Further, this perception of non-constant real returns on government securities means that the predictions of some well-known finance models may not apply to the Australian market, for example, CAPM (Felmingham and Mansfield, 1999).

Real interest rates are closely associated with crises. Corden (2008) sees *low* real interest rates internationally as having fostered the rise in credit that culminated in the global financial crisis. However, negative real interest rates may now be needed, along with new financial instruments.

The financial intermediary must be prepared to lend at a negative real interest rate, and must thus charge some kind of fee to the savers for their deposits, rather than paying interest. Lending at negative real interest rates requires the development of new financial instruments (Corden, 2008, p 16).

Such an experience of negative real interest rates would be a novelty for the current generation but is part of the Australian historical experience.

Conclusion

The central interest in this paper is understanding the conditions under which infrastructure is affordable, or not. One line of analysis has been explored with illustrative discussions offered. It is hoped that those interested in the sustainable provision of infrastructure, particularly in the regions, will find issues of interest and elements of a new agenda for infrastructure assessment. It is time to move past an uncritical we need more infrastructure mantra to well-reasoned evaluations of affordable enabling infrastructure.

Those in the various regions of Australia have a particularly important task if such evaluation is to be not only informed but also adequate and relevant. Successfully embedding an infrastructure investment into an existing economy requires a good fit and enabling engagements with what is already present. The potentials attending infrastructure investment will only be realised if those in affected areas can and do make use of this enhancing capability.

Building a road or dam, for example, may open up an area for industrial development. However, this development will only occur if those in industry see likely returns from their investment in this affected regional place and if residents can access the developed sites and available jobs. Follow-on effects including consequent developments can be many as other parties seek to take advantage of newly changed regional circumstances. That is, one change can engender others, ideally in a positive-sum and cumulatively progressive manner.

Paying for such a road or dam without which consequent development would not be able to occur, and from which widely dispersed impacts (and incomes) arise, requires much more careful consideration and sensible rebalancing of interests and payments. Infrastructure has been provided for centuries with varying levels of success. There is no reason why with fresh thinking and appropriate repositioning it cannot be successfully provided again.

Economic eras come and go. In its later days, our post-Bretton Woods era had the semblance of a perpetual wealth machine with ever-greater prosperity not just assumed, but actively promised. In the mania that built, all were to be rich via entrepreneurial drive and sophisticated finance. Now, still stunned by the panics of 2008 we try to rebuild what was. However, our world has changed – fundamentally, I would argue. A new era has begun. Even if this were to be disputed and recent events regarded as mere corrections; enough economic,

financial and societal damage is evident for even the most adventurous to question whether they are well prepared for what may lie ahead.

Crises occur when imbalances become unsustainable. Crises over the centuries have been of all manner, style, duration and intensity. While there is a common theme, typically one of unrepayable debts or like unmeetable obligations, many a story line has occurred. Country experiences are many and varied. Many in Japan in 1989 assumed a correction was underway while Asian Tigers roared ahead and post-Soviet transition economies began their journeys. Two decades later Japan is still correcting, despite all manner of stimulus including from large infrastructure projects. The Tigers have rebuilt after their unexpected 1997 crises but an emphasis on large reserves as a precaution against crisis repetition is part of the current global imbalance. The post-Soviets demonstrate all manner of development with, for example, Europe's declared best infrastructure project of 2005, being now a star failure. Resolutions of crises require a range of responses, and infrastructure affordability warrants close attention.

Infrastructure investment encapsulates several critical problems:

- infrastructure typically requires substantial funds well in advance of any returns so uncertainties are significant and should be so treated;
- infrastructure recasts the region and wider nation while supporting a range of potentials and attendant other investments;
- infrastructure is located and physically embedded in regions with impacts spread across parties, space and time making for many users and beneficiaries;
- infrastructure investments are typically cumulative in effect and multiply engaging in process, including of levels of government; and
- infrastructure failures (in provision, in use and in funding arrangements) can be widely disabling, necessitating sufficiently robust arrangements and good societal oversight.

The outputs of infrastructure underpin the outputs and outcomes for many, yet the inputs to infrastructure provision have been inadequate for a generation. Considerations now relevant include that:

- long-lived assets require more than short-term loans and irregular maintenance;
- infrastructure often has a revenue profile that is ill-suited to conventional debt financing;
- real interest rate movements need close attention and effective impact management strategies;

- debts need to be repaid, yet analysis of revenues is often deficient and sometimes deceitful;
- new approaches and instruments will be part of improving affordability and exiting crises;
- no other current alternatives to debt are without problems, but all can be improved; and
- monetary policies that compounded problems with long term investments needs to be recast to assist and enable appropriate infrastructure.

Infrastructure affordability has been a neglected issue. This will need to change if problems of the passing era are to be resolved and a more robust basis built for the emerging times and the unexpected things that will lie ahead.

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