HYBRID ANNUITY CONTRACTS FOR ROAD PROJECTS IN INDIA

Ravi Peri, Chen Chen, and Devayan Dey

NO. 68

December 2019

ADB SOUTH ASIA WORKING PAPER SERIES

ASIAN DEVELOPMENT BANK

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ADB South Asia Working Paper Series

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www.adb.org

Printed in the Philippines

ISSN 2313-5867 (print), 2313-5875 (electronic)
Publication Stock No. WPS190579-2
DOI: http://dx.doi.org/10.22617/WPS190579-2

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ABSTRACT

Various models of public–private partnerships have been used for the road sector in India. A combination of concession structure, risk, and market forces have dictated the use and prevalence of one model or the other over time. These range from models where very substantial risk is transferred to the private sector, such as toll-based build–operate–transfer, to models with minimum financing risk, like design–build–operate. One of the popular models, the hybrid annuity model (HAM), is examined in this paper. In the HAM, a substantial percentage of the project's cost (say, 50%) is paid at settled milestones during the construction period, while the balance of payments and maintenance payments would be paid proportionately over a period of 7–15 years post-construction. In analogous terms, it is like an engineering, procurement, and construction contract, but only about 50% of the milestone payments are being made during construction. This is an interesting model, since it can be widely applied to many diverse sectors and blends some financing with performance risk transfer. Despite its apparent benefits, there is a question on whether the HAM results in a "value for money" paradigm, or if it is a glorified engineering, procurement, and construction contract with risk loading by the concessionaire on deferred payments and no real benefits. This paper examines the question firstly in a mathematical framework, and then using empirical objective and subjective data. The mechanics followed may be applicable to other countries in the region, and to other sectors, where a mix of construction payments and performance-based availability payments can be used for implementing projects.

ABBREVIATIONS

BPC	–	bid project cost
DPR	–	detailed project report
EPC	–	engineering, procurement, and construction
HAM	–	hybrid annuity model
IRI	–	international roughness index
km	–	kilometer
MCLR	–	marginal cost of funds lending rate
MAPP	–	method for impact assessment of programs and projects
NHAI	–	National Highways Authority of India
NHDP	–	national highway development project
NPV	–	net present value
NBFC	–	non-banking finance company
NPA	–	nonperforming asset
O&M	–	operation and maintenance
PPP	–	public–private partnership
ROE	–	return on equity
TPC	–	total project cost
VFM	–	value for money

I. INTRODUCTION

A. Objective

In general, it is almost axiomatic to assume that public–private partnerships (PPP) bring in better "value for money" (VfM) for the government and users by way of design efficiency, better project implementation, and better asset management, while crowding-in private capital. In the Indian context, there is scant data to assess this assumed value proposition and take an objective view on the PPP paradigm for the road sector. This paper attempts to identify VfM in the hybrid annuity model (HAM) as used in national highways and state roads, since it has gained wide acceptance and is also being attempted in other sectors. This assessment is done by deconstructing the HAM costs into various elements and evaluating these either empirically or based on commercial assumptions.

B. General

Since the mid-1990s, the Government of India has progressively initiated a very large-scale, structured, and systematic approach to attract private finance to bridge India's significant infrastructure deficit and to improve sustainability. The effort has stemmed from the central (federal) government and has progressively filtered down from national projects to state sector projects. The effort primarily originated and focused on the road sector, particularly the National Highway Development Project (NHDP). However, this catalyzed PPP in almost all sectors of infrastructure and service delivery.[1]

In a more general sense, the study of the road sector, as an indicator for private financing, is quite illustrative of key characteristics of PPPs in terms of their assessment, objectives, and risks.[2] Various private sector financing models have been applied to the road sector in India, with gradual evolution of PPPs, and, along the way, many changes have redefined the process. An interesting development has been the evolution of risk-transfer mechanisms for revenue: from the initial models that focused solely on availability payments, the models have gone full circle through complete risk transfer based purely on toll and even concession premiums, then back to availability payments based on the HAM discussed in this paper. The concept of what constitutes PPP has also evolved, and this has been driven by experiences in equity and debt markets, changes in the type of roads covered, and large trends in financial markets worldwide.

As the structure of PPP in the road sector has evolved, it has also been extensively questioned. The initial assumption was that the private sector automatically brings in efficiencies in design, financing, construction, and management, and offers better VfM across the project life cycle. However, this assumption has not been supported by experience in a wide spectrum of highly visible projects and institutions such as the Dabhol Power Project of Enron, to the more recent problems of high nonperforming assets (NPAs) from infrastructure loans in banks and financial institutions, and the financial travails of infrastructure institutions such as Infrastructure Leasing & Financial Services Limited. It is important, therefore, to consider if PPP models truly give VfM, and this paper examines specifically the HAM, which is currently one of the preferred models for road sector projects and has high applicability to other sectors.

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[1] This chapter is an updated version of a 2015 publication authored by Ravi Peri, cited here: Asian Development Bank. 2015. Trial Balance: Private Sector Financing for Road Projects in India. http://hdl.handle.net/11540/4344.

[2] The terms "private sector financing" and "PPP" have been used synonymously in this paper, depending on context. Contracts relating to operation and maintenance—for which investments are low—are not included, since the focus is on the leveraging of government finance.

This introductory chapter provides a background of road sector development in India with a focus on PPPs. Subsequent chapters assess the hybrid annuity contract structure in detail.

C. Road Network in India

India has one of the largest road networks in the world, consisting of (i) national highways, (ii) state highways, (iii) major district roads, and (iv) rural roads, which include other district and village roads.[3] There are 131,326 kilometers (km) of national highways and while they represent less than 5% of the entire road network, they carry 40% of the total road traffic. The state highways and the major district roads—together constituting approximately 13% of India's total roads—represent the country's secondary road system and sustain approximately 40% of the total road traffic.

While the road network is very extensive, its quality and capacity standards are low. Surfaced roads comprise a little over 50% of the entire road network. And, despite the progress in upgrading, around 20% of the national highways have only a single lane or intermediate lanes, and only 30% of their length comprises of roads wider than two lanes. This leads to heavy congestion. The state highways are of a lower standard, with approximately 60% comprising a single/intermediate lane. The low capacity of highways is aggravated by diverse traffic, road encroachments, and poor-quality road surfaces. The capacity and quality of the road network have not kept pace with the growth in registered vehicles, which has surpassed 10% a year over the last 5 years.[4]

D. Road Infrastructure Financing

Traditionally, most investments in road infrastructure have originated from the government budget, although there has been a concerted effort to shift a substantial proportion of this investment to the private sector. The basis for this shift, which began at the end of the 1990s, is because the government budget is insufficient to meet the investment required to improve road infrastructure.

During the initial stages of various earlier projects, the expectation was that the private sector would be more efficient in identifying and developing the projects. As the process was gradually formalized, the emphasis shifted to the financing of projects. In the Tenth Five-Year Plan period (2002–2007), the aggregate investment in roads and bridges was approximately $21 billion, of which 8% was from the private sector.[5] This amount increased to approximately $64 billion in the Eleventh Five-Year Plan period (2007–2012), of which 20% came from the private sector.[6] In the Twelfth Five-Year Plan period (2012–2017), an investment of approximately $83 billion was earmarked for roads and bridges of which 26% was anticipated to represent the private sector.[7] The funding sources across the three five-year plans for roads and bridges are provided in Table 1.

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3 Government of India, Planning Commission (2013).
4 National Highways Authority of India, Indian Road Network. http://www.nhai.org/roadnetwork.htm.
5 A fixed exchange rate of $1 = ₹70 has been used in this paper.
6 Government of India, Planning Commission (2013).
7 The figures from the Planning Commission for the Twelfth Five-Year Plan were subsequently revised downward by the High-Level Committee on Financing Infrastructure. These are indicated in Table 1.

Table 1: Road Sector Financing
($ million)

Category	Tenth Five-Year Plan (2002–2007)		Eleventh Five-Year Plan (2007–2012)		Twelfth Five-Year Plan (2012–2017)	
	Public	Private	Public	Private	Public	Private
Central Sector	9,257	1,225	24,932	10,606	17,827	7,785
State Sector	10,347	374	26,280	1,921	43,356	14,259
Total	19,604	1,599	51,212	12,528	61,183	22,044

Source: Government of India Planning Commission and Second Report of the High-Level Committee on Financing Infrastructure (June 2014).

After the last five-year plan period ending in 2017, such data is not yet collated and available. Nevertheless, it is safe to assume that, over the extended period of 2002–2017, more than 25% of road sector financing was with PPP-based projects. This is indeed a very high proportion, given the scale and sustained duration, and is probably unique to India. There was a substantial increase in road sector investments over the plan periods, as well as a significant rise in the percentage of finance expected from the private sector. The Twelfth Five-Year Plan document explicitly mentioned that:

"It is widely recognized that adequate investment in the development of infrastructure is a prerequisite for higher growth. In this context, steps have been taken by the government to create an enabling environment to promote investment in infrastructure. The following steps have been taken to promote private investment in infrastructure sector: (i) Setting up robust institutional structure for appraising and approving PPP projects; (ii) Developing standardized documents such as model concession agreements across infrastructure sectors; (iii) Increasing availability of finance by creating dedicated institutions and providing viability gap funding."

E. Definition of a Public–Private Partnership

Some of the characteristics of PPP are generally understood (e.g., risk allocation to the party best able to manage risk, output-based specifications, performance-based revenue structure, etc.). The Government of India has defined PPP in the following formal manner:[8]

"PPP means an arrangement between a government/statutory entity/government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well defined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity or its representative."

This definition is quite broad and includes asset management and operations, as well as covering constructs that do not have user fees or toll charges, as in the case of most HAM arrangements.

[8] Government of India, Ministry of Finance. National Public Private Partnership Policy 2011: Draft for Consultation. http://www.pppinindia.com/Defining-PPP.php.

F. The Role of Public–Private Partnerships in Road Development

The key driver for private sector financing of the road sector on a systematic basis in India was the launch of the NHDP in 1998, led by the National Highways Authority of India (NHAI). The NHDP evolved in phases, as indicated in the following list, while the road lengths are indicated in Table 2:

Phase I: Augmenting the "Golden Quadrilateral," connecting the four largest metropolises
Phase II: Augmenting the North–South and East–West corridors
Phase III: Creating four-lanes on high-density national highways, connecting the state capitals with the areas of economic, commercial, and tourist importance
Phase IV: Upgrading single-lane roads to two-lane standards
Phase V: Expanding four-lane highways to six lanes
Phase VI: Building 1,000 km of expressways
Phase VII: Building ring roads, bypasses, underpasses, flyovers, etc.

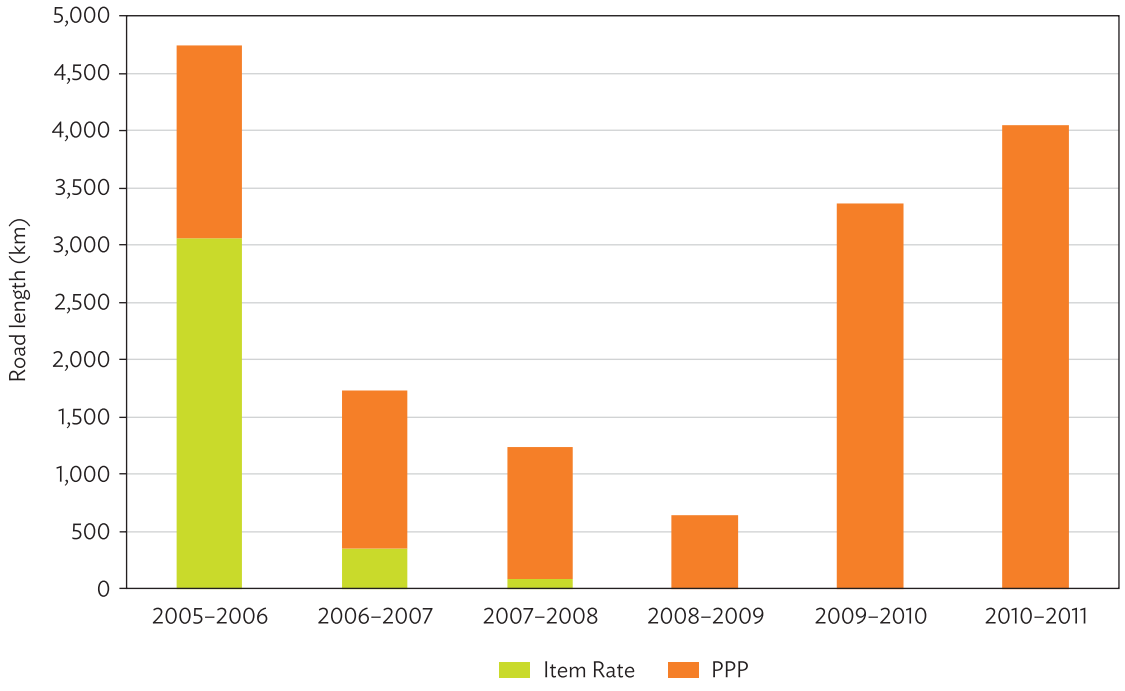
Table 2: Status of National Highway Development Project Phases

	Total Length (km)	4–6 Lanes (km)	Under Implementation (km)	Balance Length for Award (km)
Golden Quadrilateral	5,846	5,846	0	0
North–South and East–West, Phases I and II	7,142	6,568	300	274
Port Connectivity	435	383	52	0
NHDP Phase III	11,809	7,621	2,161	2,027
NHDP Phase IV	13,203	4,058	6,050	3,095
NHDP Phase V	6,500	2,564	1,428	2,508
NHDP Phase VI	1,000	0	184	816
NHDP Phase VII	700	22	94	584
NHDP Total	48,793	28,915	10,574	9,304

km = kilometer, NHDP = national highway development project.
Source: National Highways Authority of India. http://nhai.gov.in/about-nhdp.htm (accessed 23 March 2019).

Since government budgets were limited and the perception was that many national highways would be financially viable for the private sector, the NHDP gradually shifted to using PPPs. During the NHDP Phases I and II, PPPs were under assessment, with only some roads being included. From Phase III onward, however, the PPP model began to gain favor. Prompted by the NHDP and the availability of standard modalities and documentation relating to PPPs, many state governments also began to adopt the PPP model for other road projects. PPPs were thus formalized in the 2000s, tolling became acceptable, and private sector financing became the norm. Social and political acceptance for the model also increased, and it became the "default" option at the national level and in many state government jurisdictions. The "PPP approach as the first option" was probably unique to India, and this strong shift is illustrated in Figure 1.

Figure 1: Transition to Public–Private Partnerships in National Highways



km = kilometer, PPP = public–private partnership.
Source: Department of Economic Affairs, Government of India. PPP in India: https://www.pppinindia.gov.in/.

II. EVOLUTION OF PUBLIC–PRIVATE PARTNERSHIP MODELS

A. Public–Private Partnership Models

Over time, the Government of India has adopted the following PPP models:[9]

(i) **Build-Operate-Transfer models with a user-fee approach.** These operate on a user-charge recovery base (e.g., tolls) which may also be supported by some form of capital cost support or viability gap fund.

(ii) **Annuity-Based Build–Operate–Transfer models.** These relate to projects, where it is infeasible for sizable cost recovery through user charges. No construction-stage payments are made, and payments are made through contracts based on availability/performance payments over an extended length of time (10–15 years post-construction).

(iii) **Hybrid Annuity-Based Build–Operate–Transfer models.** These relate to projects where the private sector is unable or unwilling to take even the risk of full investments and subsequent annuity payments. A substantial sum of money (40%–60%) is paid during construction stage. The balance of payments are made through contracts based on

[9] This chapter is an updated version of a 2015 publication authored by Ravi Peri, cited here: Asian Development Bank. 2015. Trial Balance: Private Sector Financing for Road Projects in India. http://hdl.handle.net/11540/4344.

availability and performance payments over an extended length of time (about 7–10 years post-construction).

(iv) **Performance-Based Maintenance contracts.** These improve asset creation and maintenance efficiency and involve low levels or no capital investments.

(v) **Modified Design–Build (Turnkey) contracts.** These are like engineering, procurement, and construction (EPC) contracts with operation and maintenance (O&M) obligations tagged on. Payments are linked to achievement of tangible intermediate construction milestones and short-period maintenance responsibilities for about 5 years. The primary benefits of such contracts include efficiencies in design and implementation as well as improved quality of asset.

B. Annuity-Based Public–Private Partnership

In the early years when private investment was not the norm in India, it was not recommended to assign the risks associated with the collection of tolls to the private sector. At the time, the government was planning to improve a very large road network through the NHDP, and it was unable to rely on traffic forecasts, even under the most favorable economic conditions and environment. It was, therefore, considered prudent to avoid transferring the traffic risk (and the consequent likely risk-loaded rates of return) to the private sector. At the time, it was also unclear whether the practice of levying tolls on many roads would be acceptable to users. To avoid direct tolling, an annuity scheme was proposed, under which the private investment in the construction, maintenance, and operation of the road infrastructure would be serviced through semiannual (annuity) payments from the NHAI. The (approximately) uniform 6-monthly payments would be made over a period of approximately 15 years; and these "annuity" payments would be the bid parameter for being awarded the concession. The annuity method was considered to carry the least risk to the PPP investor.[10]

The NHAI then streamlined the documents and processes relating to the annuity model. One of the first projects was the Panagarh–Palsit Highway (NH2), approximately 65 kilometers (km), to be upgraded from two lanes to four lanes. The project, for which the bid annuity payment was in the order of $9 million, was awarded in 2001 to a Malaysian consortium. However, the arithmetic sum of annuity payments over the 15-year period resulted in a figure that was over five times the project cost of a regular item-rate contract. Criticism arose from the public and the media, with a national magazine defining the case as the "great highway robbery."[11] The fact that the simple addition of 15-year cash streams may be an inaccurate way to compute cost (net present value, cost of capital, cost of O&M for 15 years, etc.) was apparently not considered. The annuity payment method has continued to have many critics for similar reasons:

There is still concern that annuity payments are a method to defer funding, thus preventing the transfer of substantive risk to the private sector. A report by the Planning Commission opined that *"While concessions based on user charges lead to mobilization of additional resources, annuity concessions*

[10] This model is like the United Kingdom's private finance initiative, which has extensively used an "availability payment" method for the building of schools and hospitals to be designed, built, financed, and managed by private entities under contracts of approximately 30 years. The United Kingdom has also undertaken various annuity-based PPPs for highway projects where roads are not tolled.

[11] Krishnan (2001).

imply deferred government payments akin to borrowings and do not normally lead to mobilization of additional resources." [12]

The arithmetical summation methodology, illustrated above, has remained in the minds of many who are connected to or keep abreast of the process. Annuity bids, in general, are perceived to be significantly inflated in relation to regular contracts.

The Planning Commission had highlighted the fact that annuity contracts are a way to treat project finance as "off balance sheet," since government budget mechanisms fail to capture the contracted future liability cash stream of these projects. PPPs also create explicit and implicit obligations on the part of the public entity that is party to them so that, in the final instance, they become contingent liabilities of the Government of India. The fiscal fallout of such partnerships could reflect on the health of the aggregate balance sheet of the public sector and may create demands for enhanced budgetary support to the public sector entities contracting such liabilities. Explicit contingent liabilities, which may be in the form of stipulated annuity payments over a multiyear horizon, should be spelled out (footnote 12).

C. Toll-Based Public–Private Partnership Models

Concerns on the expense of annuity projects, combined with the perception that these used only deferred payments that did not fully leverage private sector finance, led the government to progressively move away from annuity concessions and adopt toll-based PPP.

As indicated in Figure 2, since 2006, the pipeline for traditional construction contracts has shrunk, while that for PPP has increased. Coupled with increased use of toll-based formats in PPPs since 2009, this has coincided with the increased willingness of private sector developers to take up such projects. Taken together, PPP projects in the road sector, especially in National Highway projects, became substantial. For projects that were not so viable, the government also introduced the "viability gap fund." A significant upward cycle started in 2009, which peaked in 2012. By this time, bidders were placing bids with "negative viability support," and paying substantial "concession premiums" to the government for the concession.

1. The Reversal

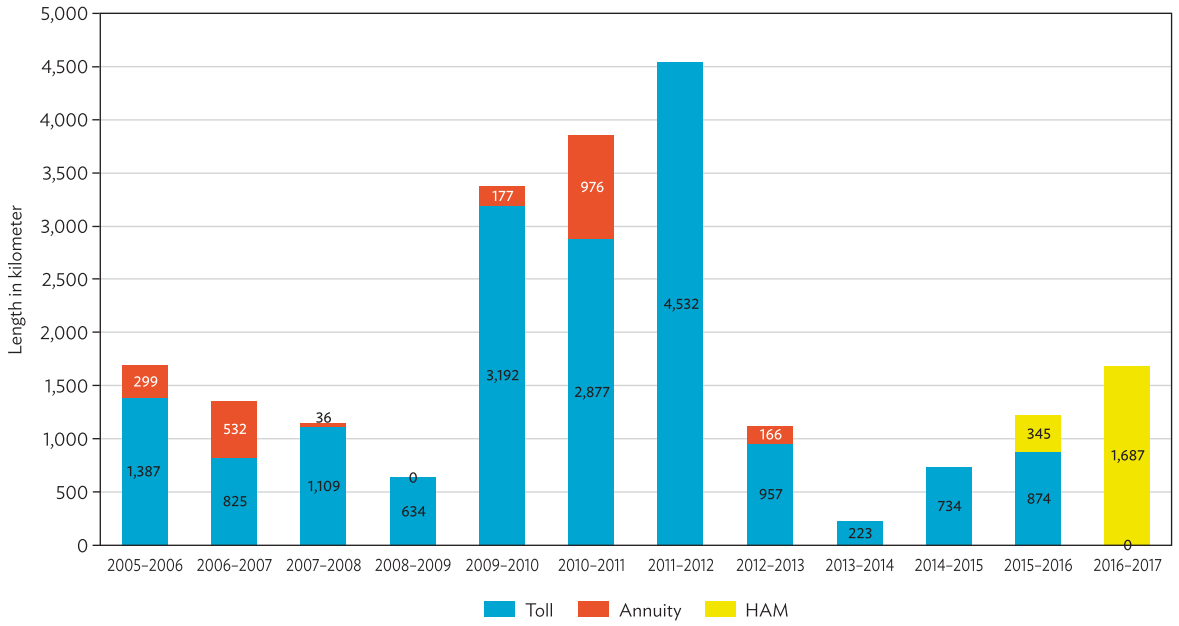
On the flip side, as the system became standardized and bidder interest was taken for granted, the project preparatory studies declined to the level of a feasibility assessment. Given that the risk of a PPP bid lies with the bidder, government agencies felt justified that it was the responsibility of the bidders to carry out greater due diligence. The bidders, however, were resource-constrained and faced competitive pressure, and so did the lenders, who were also responsible for scrutinizing a project's financial model. Many project bids returned a "negative grant," appearing to be a windfall for the government agency.[13] For example, GMR Infrastructure won a bid for a road project from Kishangarh (Rajasthan) to Ahmedabad (Gujarat) at an estimated cost of approximately $900 million, with a negative grant of approximately $100 million.[14] This appears far more than the government would have

[12] Government of India. Planning Commission (2010). *Report of the Task-Force on Ceilings for Annuity Commitments, 2010*.

[13] A negative grant or concession premium is when a bidder provides the government agency with an up-front payment rather than asking for a grant for viability support.

[14] Kumar and Seetharaman (2011).

Figure 2: Public–Private Partnership Model Awards for National Highways



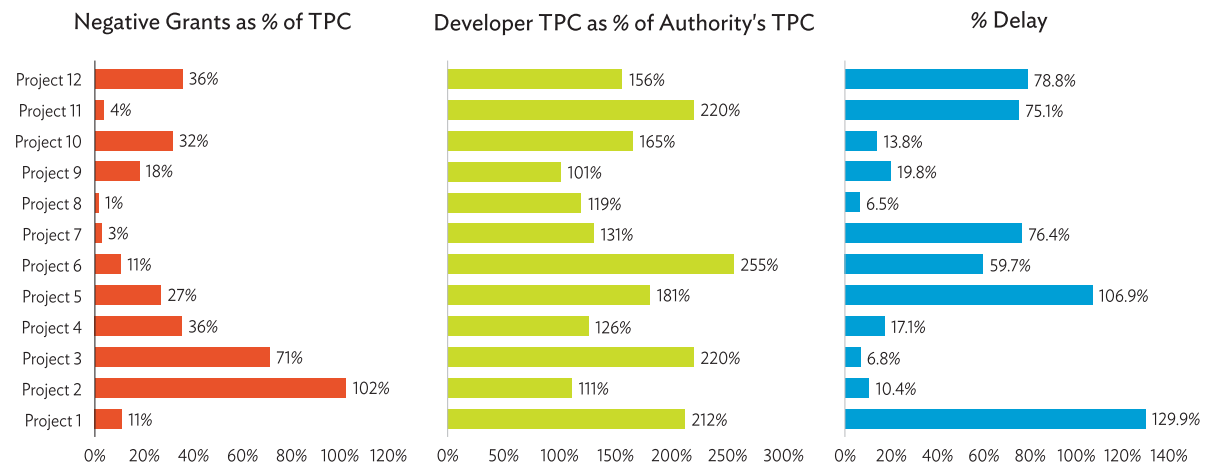
HAM = hybrid annuity model.
Source: Department of Economic Affairs, Government of India. PPP in India: https://www.pppinindia.gov.in/.

anticipated even during a time when there was optimism in favor of road PPPs. In 2013, the company pulled out of the project, citing reasons of land acquisition and environmental clearances.

There are three critical elements of project preparation: project cost, traffic forecasts, and time for land acquisition and clearances. Within these elements, traffic forecast is somewhat speculative in nature and particularly subject to optimism and pessimism. However, in the cycles of optimism, all three tend to be favorably interpreted and therefore challenges are underestimated; this results in project implementation delays and financing issues.

Figure 3 illustrates this peculiar trend in relation to project costs: the central bar chart indicates the costs, as estimated by bidders, as being higher than the estimates of the government. The chart on the left indicates the willingness of bidders to pay "negative grants" for the concession, while the consequent delays are indicated in the right-side bar chart. In many cases, project preparation was overly optimistic on time required for land acquisition and clearances, and the consequent delay escalated costs as compared to the initial estimates. In 2013, the cycle of optimism reversed, accompanied by challenges such as stress in the financial and banking sector, developers being unable to raise equity, long delays in project clearances and land acquisition, delayed arbitral awards, and so on.

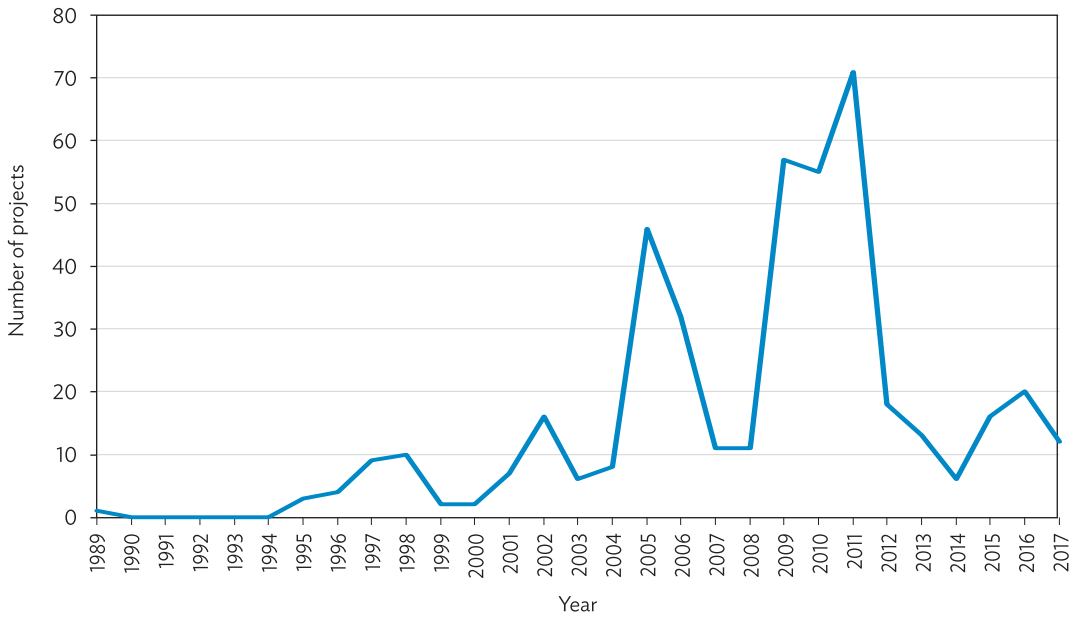
Figure 3: Higher Costs, Optimism, and Delays



TPC = total project cost.
Source: Department of Economic Affairs, Government of India. PPP in India: https://www.pppinindia.gov.in/.

Contributing to this shift in cycle may also be the fact that many of the more viable projects were already taken up, and the rest could no longer be done on the same optimistic premises as before. After 2012, the number of road sector PPP projects in India dropped significantly (Figure 4).

Figure 4: Number of Road Project Public–Private Partnerships by Year



Source: The World Bank. Infrastructure Finance, PPPs & Guarantees. http://ppi.worldbank.org/ (accessed 15 April 2019).

2. Stress in Debt Finance

The concerns associated with infrastructure projects are well known, which include, among other things, long gestation period leading to asset liability mismatch for banks, and delays associated with land acquisition, environmental clearances, and other statutory approvals. While issues around project preparedness (land acquisition, clearances, etc.) are getting gradually addressed by some measures taken by the government, a primary concern may be the supply-side sourcing of funds for infrastructure projects.

Commercial banks have been the primary providers of finance to the infrastructure sector. However, concerns over debt funding from banks have emerged recently wherein lending in PPP projects have seen a slowdown, and presently, even item-rate contracts are facing difficulties in procuring working capital or bank guarantees. In the period March 2015–March 2018, deployment of gross bank credit in infrastructure witnessed a negative growth rate (–0.92%), from about $130 billion in March 2015 to $127 billion in March 2018.[15]

This may partly be attributed to the rising share of nonperforming assets in the finance sector, the bulk of which have come from infrastructure lending. Gross NPAs in the banking sector increased from 16.7% in March 2017 to 22.6% in March 2018. The gross NPAs were pegged at around $148 billion, or around 11% of total advances as of 31 March 2018.[16]

The rising share of NPAs from the infrastructure sector forced banks to reduce their lending to the sector, shifting the focus toward non-banking finance companies (NBFCs) for requisite funds. During 2013–2014 and 2017–2018, disbursements of NBFCs grew at a compound annual growth rate of about 17%.[17] These NBFCs, which started being recognized as a strong source of debt funding for infrastructure projects, are also now facing severe financial issues. For example, Infrastructure Leasing & Financial Services Limited, a 30-year-old leading infrastructure development and finance company, and which had a high domestic rating and government-owned shareholders, defaulted on its obligations in 2018 and headed into a financial scandal. This financial crisis had triggered a "trust deficit" in India's financial markets and banking sector. After the crisis, the cost of funds from banks increased by 0.5%–0.75%, resulting in higher borrowing costs for ongoing and upcoming infrastructure projects.[18]

3. Stress in Equity Investments

Early equity investments, in the Indian context, were generally by contractors who took on a promoter role. Apart from promoter equity, the sources of equity had been limited until recently, since banks and financial institutions rarely invested in equity.

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15 Source: Reserve Bank of India.

16 Surabhi. Ksenia Kondratieva. The Hindu Business Line. 2018. *Lending to infrastructure sector sees negative growth in last two fiscals*. https://www.thehindubusinessline.com/money-and-banking/lending-to-infrastructure-sector-sees-negative-growth-in-last-two-fiscals/article24391821.ece.

17 Indian Infrastructure. 2018. *Reality Check*. https://indianinfrastructure.com/2018/12/28/reality-check/.

18 The Economic Times Markets. 2019. *NBFCs could shine in Q4, but credit growth may disappoint*. https://economictimes.indiatimes.com/markets/stocks/earnings/nbfcs-could-shine-in-q4-but-credit-growth-may-disappoint/articleshow/68882010.cms.

Two factors contributed to the dearth of equity finance: the first key issue has been the need to lock-in the investments for significant periods because of requirements of the concession agreements and lenders' covenants for financing. Lock-in provisions hamper a rollover of investment capacity and prevent the emerging of any secondary strong market in project equity. However, with recent reforms in exit policies introduced by the government, there has been some movement in releasing locked equity.

The second issue is about the enabling environment, which has been somewhat vitiated by delayed clearances and land acquisition, lack of regulatory institutions, absence of a credible dispute resolution mechanism, noncompliance by government agencies, and so on.[19]

While the government took a series of steps to improve the PPP investment climate and resolve many tangled issues, the more general trend has been to turn to other models of PPP such as the HAM and EPC with extended performance-based maintenance. The EPC model, which transfers design, implementation, and maintenance risk to the contractor, has minimal financing risk. Meanwhile, it may be used as a benchmark to evaluate the HAM bids. This paper examines only the HAM, since it has a modicum of financing risk, including need for some debt and equity investment.

4. Rise of Development Investments

One interesting observation about PPP is the rise of development finance. Both the Asian Development Bank (ADB) and the World Bank accept the HAM for procurement and contracting. The value additions of development finance include the sources of funding, the direct and indirect impacts of credit enhancement, as well as the capacity development on procurement, project management, performance monitoring and evaluation, and safeguards. While the absolute value of development investments is small, the impact can be far-reaching in terms of credibility and catalysis.

III. THE HYBRID ANNUITY MODEL

The annuity scheme, discussed in earlier sections, was one where the private investment in the construction, maintenance, and operation of the road infrastructure would be serviced through semiannual (annuity) payments from the NHAI. The risk of toll revenues was not placed on the private sector, and the government made (approximately) uniform 6-monthly "annuity" payments over a period of about 15 years post-construction.[20] The annuity method was considered to carry the least risk to the PPP investor; however, in the present market context, even this method has become quite difficult. Furthermore, while the concept of the annuity scheme is reasonably well accepted for national highways and central sector agencies, promoters perceive a higher risk of missed annuity payments in state sector projects (state highways and other roads).

To further reduce the revenue risk to the private sector, while keeping the design, implementation, and maintenance risk transfer at significant levels, the government proposed the hybrid annuity model (HAM). In the HAM, a substantial percentage of the project's cost (say, 50%) is paid at settled milestones during the construction period. In analogous terms, it is like EPC but as if only about 50% of the milestone payments are being made during construction. The balance of deferred construction payments, maintenance payments, and stipulated interest on capital investment

[19] Planning Commission. June 2014. *Second Report of the "High Level Committee on Financing Infrastructure."*

[20] Average operation period of 15 years is considered.

would be paid by proportionate 6-monthly payments over a period of 7–15 years post-construction. The option to toll the roads was not treated as a direct revenue but attributable to about 10% of project cost.[21] The basic principles of the HAM contract document are as follows:[22]

(i) Design and construction risks are entirely passed on to concessionaire;

(ii) Milestone payments are made, at which the concessionaire only gets the part of capital cost incurred until that point;

(iii) In case of delayed completion, there are liquidated damages for every day of delay. In addition, annuity revenues would also be delayed, and the concessionaire is effectively penalized. Conversely, on early completion, a bonus may be paid to the concessionaire and the annuity revenues can start faster; and

(iv) Balance of deferred capital payments, interest thereon, and O&M costs are paid as (6-monthly) annuity payments for a specific length of time subject to meeting performance metrics.

A. Costs and Benefits of Hybrid Annuity Model

With these features, the HAM falls somewhere between the EPC contract with extended maintenance obligations and a full PPP annuity scheme—hence the term "hybrid." On the positive side of the argument of whether the HAM is truly "PPP," the HAM does place a modicum of financing risk on the private sector, and transfers design, implementation, and asset management risk fully, as well as mechanisms to incentivize concessionaires for timely and quality project completion. On the contrary, it may be perceived as a glorified EPC contract wherein a portion of project costs is deferred to the operation period. Some would even argue that there is no real risk transfer beyond that of an EPC, but possible higher cost on account of deemed investment from the private sector. While an HAM may have some of the risks associated with "Annuity" contracts (section 2.2), such as "off-balance sheet" funding that may lead to fiscal overcommitment and hidden contingent liabilities, these will be lesser than full annuity projects since a substantial portion of capital expenditure is paid up front and subsisting annuity obligations are lower.

1. Price and Costs

The price side of the HAM is relatively easy to assess, and this is the net present value (NPV) of cash flow streams payable to the HAM concessionaire. These, in turn, consist of two parts: cash flows during construction stage and cash flows during the annuity stage (post-construction). Symbolically, P_{NPV} = NPV of $\sum(P_{construction} + P_{annuity})$, where *P* represents the payments and the subscripts are self-explanatory. NPV calculations typically have the problem of choosing the appropriate discount rate, but that can be resolved in some standard way such as using the long-term government bond rate. With these, the NPV for the project can be easily determined.

[21] The roads could also be tolled separately by the government or its nominated agency, outside of the HAM contract.

[22] The website of the Ministry of Road Transport and Highways has the full document in PDF file type, available at http://www.morth.nic.in/ (accessed on 4 April 2019). The specific link location changes once in a while but will likely remain on http://www.morth.nic.in/.

However, if the public sector were to try and evaluate a bid for purposes of award, this NPV must be deconstructed into comparison benchmarks. The deconstruction of this price into its constituent parts is not so simple. The only clear and available benchmark is the item-rate cost from the detailed project reports (DPRs). Any additionality, even for shifting from item rate to EPC price, is based on some costs that can be reasonably assumed, such as for working capital and insurance; and some that are difficult, such as risk premia. When investments and financing are added on, there are additional difficult variables such as inflation projections, cost of debt, and return on equity. If one approaches this from the cost side:

$$C_{NPV} = \text{NPV of } \sum(C_{BOQ} + C_{\triangle EPC} + C_{maintenance}) + C_{debt} + C_{equity}$$

'*C*' relates to cost, subscripts '*BOQ*' refers to the base item-rate costing based on detailed project reports, '$\triangle$*EPC*' refers to incremental cost for design and build with milestone payments, and '*maintenance*' refers to costs incurred over extended maintenance period. Of these, C_{BOQ} and $C_{maintenance}$ can be reasonably well assessed from the DPRs and are, in fact, comparable to routine contracts on admeasurement. The additional C_{EPC} can be assessed through past data comparing similar admeasurement and EPC contracts. If such data is unavailable for a reasonable sample size, it can be computed by adding costs such as design, working capital, insurances, and so on. Since milestone payments are completely made in an EPC contract, with no financing risk to the contractor, this EPC cost can be taken to be reasonably free of financing risk premia.

The uncertainty in C_{debt} and C_{equity} is greater, and quite difficult to assess. The HAM arrangement typically stipulates a bank rate-based mechanism for paying the interest on deferred capital investment. The stipulation is that every annuity payment would have the corresponding interest (such as Bank Rate + 2%) on the deferred capital. However, this standard rate would very likely not be the one at which the concessionaire is able to raise funds. Given the investment requirement because of deferred capital repayment, the concessionaire would fill this by way of a mix of debt and equity. The costs of these would be quite variable, depending on institutions, corporate risk profiles, risk appetite, and so on. C_{debt} and C_{equity} are therefore projected increments over the stipulated interest payment rate of the HAM contract.

If benefits are not properly considered, this will be akin to the government borrowing from the private sector developer. In that sense, $C_{debt} + C_{equity}$ is just financing cost to the government. The figure $P_{NPV} - C_{NPV}$ is defined here as the HAM premium—a positive number will indicate that the concessionaire is looking to add a premium over its costs for working on an HAM project. The implications of the HAM premium will be examined in later sections.

In the absence of a mechanism to compute these rates, the government tried not to assess this number but to cap it. For instance, in 2009, the B.K. Chaturvedi Committee constituted by the government recommended a cap of 18% on the Return on Equity; but did not indicate how this was to be computed. From the procurement perspective, it is not quite clear as to why the private sector returns need to be capped, rather than to assess benefit to government and users. The question is whether it makes sense to decline PPP just because the private sector is making indicatively more returns. From the symmetry of arguments as well, it may be unfair to just cap upside equity returns without protecting downside risks.

2. Illustrative Cost Computation

In this section, we have carried out an illustrative computation of the Cost of Equity for the infrastructure sector using the Capital Asset Pricing Model.

As per the Capital Asset Pricing Model, the Return on Equity (ROE) for the infrastructure has been computed as follows:

$$ROE_{\text{Infrastructure Sector}} = \text{Return}_{\text{10 year Treasury (India)}} + \beta_{\text{infrastructure}} (\text{Return}_{\text{Nifty}} - \text{Return}_{\text{10 year treasury (India)}})$$

For this computation, the following assumptions have been made:

$\text{Return}_{\text{10 year Treasury (India)}}$: Yield on 10 year treasury bond as issued by the Government of India on 15 April 2019= 7.39% [23]

$\text{Return}_{\text{Nifty}}$: Average of Nifty returns in the last 18 years which is equal to 13.72% [24]

$\beta_{\text{infrastructure}}$: Value of levered beta for 16 infrastructure companies= 1.31

Based on the same, the value of the ROE for the infrastructure sector has been computed, which is equal to 15.69%. It should be noted that infrastructure companies execute projects in multiple sectors such as roads, ports, urban, rail, etc. Hence, the volatility of the stock price with that of the market is a representation of the risks prevalent across all the subsectors within infrastructure and may not be representative of the road sector alone. However, owing to data limitations, beta values, as computed above, have been considered as a proxy for the road sector. Computation of the unlevered beta and levered beta for comparable infrastructure companies is provided in Appendix I.

3. Benefits

If the hypothesis is that a contractor working on item-rate construction and maintenance contracts does equally good quality of asset creation and maintenance as a contractor working on EPC or HAM, with all else being the same, the benefits for all three contract types—item rate, EPC, or HAM—would be the same. In such a case, the only reason for the government to agree to pay a higher price for HAM concessions would be the capped cost of financing $C_{\text{debt}} + C_{\text{equity}}$. Road users would expect to get no additional benefits and would be indifferent to the outputs of the contracting modes.

However, the government appears to prefer EPC contracts with extended maintenance, or the HAM, because of the perceived additional value that the government and road users expect to get. These perceived benefits are the following:

The first implicit benefit, and one that is somewhat controversial, is that the government keeps the deferred payment capital expenditure as "off balance sheet." The deferred capital expenditure,

[23] Yield on 10 year Treasury Bond as issued by the Government of India. https://countryeconomy.com/bonds/india?dr=2019-04 (accessed 24 May 2019).

[24] Return on 50 share NIFTY for the period from 2000 to 2018. https://www.niftyindices.com/reports/historical-data (accessed 24 May 2019).

plus interest, is paid back to the private sector by way of annuity payments over several years but is not directly booked as government borrowing.[25]

The second expected benefit is timely project completion and on budget. This is because the private sector has an incentive to complete and start annuity revenues and contractual incentives.

The third is an expectation of better asset quality. The expectation is that, since the HAM contractor bears a risk for 7–10 years post-construction, the asset design and construction would be of higher quality. The seamless arrangement from construction to maintenance will also minimize premature deterioration, as can be observed in many roads under the traditional build, transfer, and maintenance scheme.

And lastly, a higher asset quality with HAM contractual provisions for performance-based maintenance for 7–10 years would also translate as higher service levels for road users. Unlike a routine construction contract, where subsequent annual budgetary provisions and separate contracts are required for maintenance, the provisions of the HAM contract ensure fund flows related to maintenance obligations.

For the road user, if the first item is omitted, the benefits need to be translated into timely project completion, with better asset life and quality.

$B_{HAM} = B_{time} + B_{service}$, where '*B*' indicates benefits and the subscripts indicate the source.

The benefits of timely project completion (B_{time}) can be assessed in an empirical way, if enough data is available. $B_{service}$ is far more difficult to assess empirically: while there are metrics such as international roughness index, it is unlikely that there are comparative datasets for item-rate and HAM projects. Translating these engineering metrics into financial benefits is even more cumbersome since this would require road-specific assessment of traffic, fuel and time savings, and avoided costs of vehicle maintenance.

4. Value for Money

Based on the previous discussion, and if one relates only incremental benefits and costs, the Value for Money (VfM) to the road user is considered as given:[26]

$$VfM_{HAM} = (B_{time} + \Delta B_{service}) - (C_{debt} + C_{equity})$$

In this expression, only incremental benefits and costs are considered.[27] In the equation, B_{time} can be assessed in an aggregated way, if one knows the avoided cost of delays as between regular item-rate contracts and HAM (or other PPP) contracts. $C_{debt} + C_{equity}$ can be reasonably assessed from market data. The only problem lies in the incremental service levels of asset quality and maintenance, $\Delta B_{service}$: as pointed out previously, this is difficult to assess except in a qualitative manner. This can be

[25] This has led to some guidelines, drafted by the Government of India, on limiting annuity payments to a percentage of government budgets.

[26] It may be noted that this construct omits the "price" and, therefore, the HAM premium. The effect of this would be considered in later sections.

[27] B_{time} is entirely considered an incremental benefit, since an item-rate contract is considered subject to "normal" systemic delays.

done by assessing a correlated set of HAM and item-rate contract roads with similar characteristics over a certain period of time. There have been some attempts to assess this difference in quality, but converting this to an objective value is not easy.[28] Moreover, for a government agency taking a decision on awarding an HAM contract a priori, depending on a specific forecast of service levels during the 7–10 years after construction, would be questionable. It is one thing to say that the assets may be better maintained, based on anecdotal evidence, but quite another to ascribe a value to this. For VfM_{HAM} to be positive, therefore, it is to be examined whether $B_{time} - (C_{debt} + C_{equity}) > 0$ is a sufficient condition. Subsequent sections of this paper attempt to approach this assessment of value using an empirical approach.

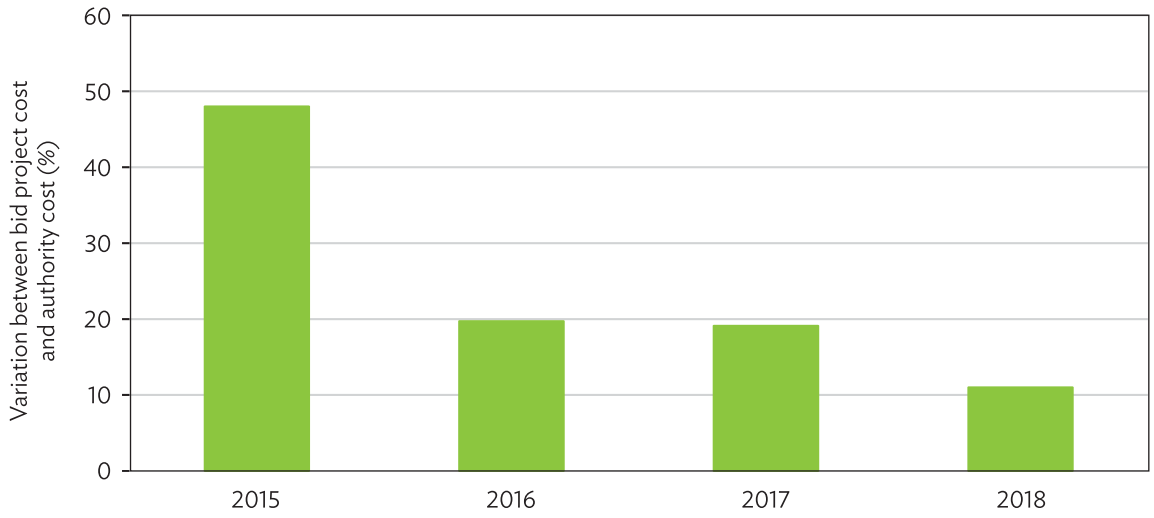
IV. EMPIRICAL ASSESSMENT OF HYBRID ANNUITY MODEL COSTS

After toll-based PPP projects started stagnating in 2012 due to delays and constrained liquidity in the private sector, the NHAI shifted its focus to other forms of contract such as the EPC. Subsequently from 2015 to 2016, it then shifted to a "hybrid" model containing features of both the EPC and PPP (Annuity), the details of which have been given in previous sections.

A. Simplistic Comparisons

It appears that the degree of variation between the estimated cost and bid cost ("HAM premium") has decreased over the last 4 years, indicating either improved efficiency in HAM projects with more experience, or better prepared DPRs.[29] However, notable HAM premiums still exist.

Figure 5: Hybrid Annuity Model Premium Over Time



Source: National Highways Authority of India: https://nhai.gov.in.

[28] Singh (2018).
[29] Data as obtained from NHAI website/NHAI MIS and primary stakeholder consultations.

Another perspective for critical assessment of the HAM premium is typically the "per lane-kilometer cost" assessment.[30] The cost of construction per lane-kilometer (lane-km) has been analyzed for 31 projects belonging to the State Highway project constructed on an item-rate basis,[31] and 43 projects executed or currently being executed on an HAM basis. The tendered costs have been adjusted for inflation to reflect fiscal year 2018 prices.[32] The analysis suggests that cost of construction per lane-km has been about $280,000 per lane-km for item-rate contracts, as compared to $560,000 per lane-km for projects executed or currently being executed on PPP (HAM).[33] The difficulty in using this (100%) increase in cost of construction in HAM contracts is that it folds in many factors other than HAM premium. These factors, discussed previously, include the pricing of the design, cost of capital, O&M risks, and use of better design specifications with transfer of maintenance risk.

An analysis of the projects being implemented on HAM and EPC modes in Rajasthan, under the Rajasthan State Highway Investment Program (Tranche-1) being financed by ADB, also reveals variation between per lane-km costs. Three HAM packages and one EPC package were tendered in 2016–2017. The HAM premium works out to about 20%, in line with the statistics shown in Figure 5.[34]

In summary, it appears that HAM projects are more expensive, and the HAM premium ranges between 10% and 20%, even though such premium seems to be coming down in recent years.

B. The "Bid Project Cost" as an Anchor

Almost invariably, the Bid Project Cost (BPC) is used as a comparator for the assessment of comparative value. However, this may not be correct, given the way the financial structure of an HAM is built.

The HAM typically states a bank-rate based mechanism for paying the interest on deferred capital investment. The stipulation is that every annuity payment would have the corresponding interest (such as Bank Rate + 2%) on the deferred capital on reducing balance basis. However, this has implications on how the bidder would quote for the project. Given the investment requirement because of deferred capital repayment, the concessionaire would fill this by way of a mix of debt and equity. Historical data suggests that Bank Rate + 2% would best be at the level of marginal cost of funds lending rate (MCLR), and it is unlikely that the lenders wouldn't add risk spread on the MCLR while financing debt. On the equity side, the cost of capital is likely to be even higher. Any incremental cost of capital over the stipulated Bank Rate + 2% can be accommodated only by raising the bid price. This reflects in an apparently higher bid project cost.

In cases where the O&M price is separately bid, some bidders may strategize to load more on BPC and less on O&M or vice versa, depending on their perception of risk and competition. Furthermore, bidders may hedge long-term O&M cost variation owing to inflation, by padding BPC.

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30 For evaluation of the cost of construction per kilometer of the road, normalization of the road length is done to "lane–km." To simplify, cost attributable to structures is ignored.

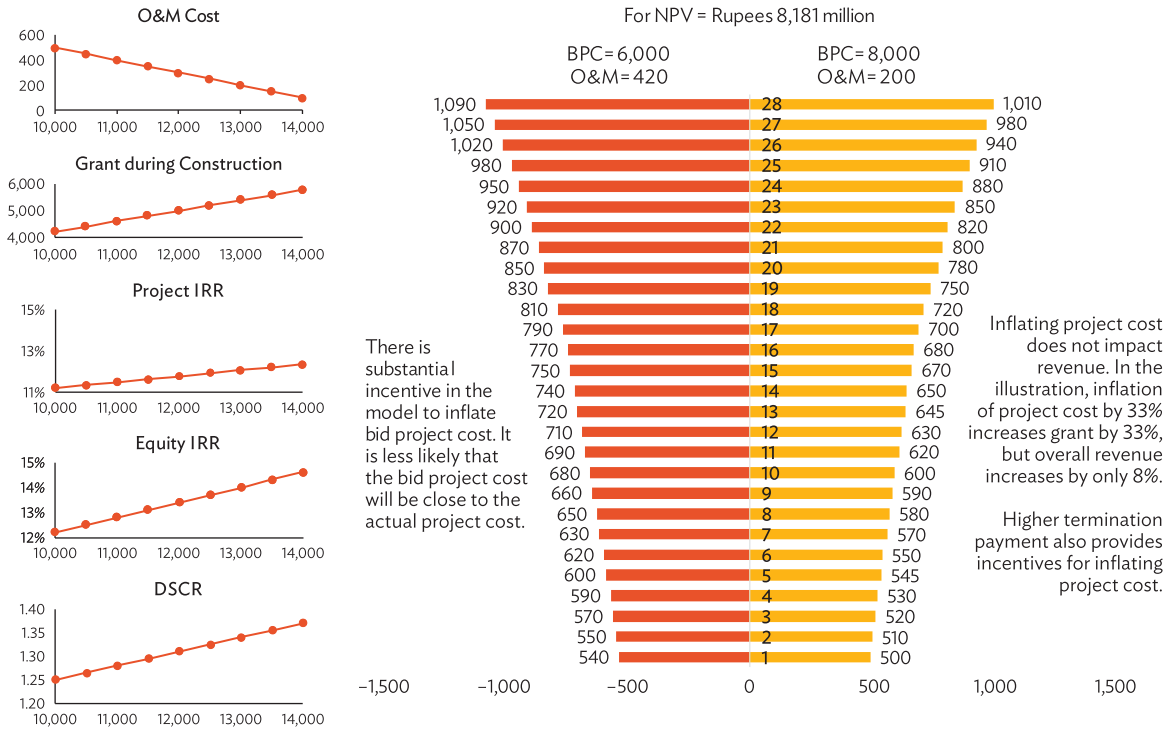
31 Given limited number of item-rate contracts awarded in national highways in recent years.

32 The tender cost has been adjusted by assuming an inflation in construction costs by 5% per year.

33 Bid project cost for HAM projects adjusted by assumed inflation of 5% per year from the date of bidding to fiscal year 2018 comparison.

34 Comparing projects under HAM and EPC modes.

Figure 6: Gaming the Bid Project Cost



BPC = bid project cost, DSCR = debt service coverage ratio, IRR = internal rate of return, NPV = net present value, O&M = operation and maintenance.
Note: All amounts are in Rupees, million.
Source: Simulation generated by authors.

The conclusion is that comparing BPC to estimated project cost, or even a per lane–km inter se cost comparison based on BPC, is unlikely to provide a good basis. The right approach would be to consider a whole life-cycle cost approach in which bidder's bidding strategy loses materiality. This is discussed in the next section.

V. VALUE FOR TAXPAYERS' MONEY

"Value for Money" (VFM) is understood as the optimum combination of life-cycle costs and quality of a good or service to meet the user's requirement. It is not just the choice of goods and services based on lowest cost bids but is based on most economically advantageous value. VFM is a relative concept and is assessed based on comparison of cost and benefit impact on the users under various procurement routes—in this case, item-rate and HAM contracts. Given that benefits cannot be always quantified, VFM assessment comprises a combination of qualitative and quantitative factors. The objective is to understand VFM in a context where there are both proponents and opponents of the HAM arrangement. The argument on higher cost of capital for the private sector is true, and the approach in this paper acknowledges the same, perhaps in a more visible manner, as "HAM premium."

Traditional VFM approaches focus on how inefficient traditionally procured contracts are, whereas the efficiencies of PPP are built into the model in a rather simplistic manner. Data shows that

PPPs in India have had their fair share of time overruns, and critics then are right to argue against the case of inefficiency occurring only in traditionally procured contracts. However, the impact of built-in incentives for early completion needs to be acknowledged. This paper uses an approach where PPPs and item rate start at a similar level of efficiency (or inefficiency), and thereafter it is examined how efficiency drivers of PPPs affect the "value," using empirical data.

Traditional VFM approaches build the maintenance cost over construction cost of the item-rate contracts to make it comparable to PPPs. This approach takes the route of neutralizing the O&M cost from the life-cycle cost to arrive at a figure comparable to item-rate construction cost.

The focus of the paper has been to keep calculations simple. For example, varying degree of investment in maintenance may provide corresponding service levels and, therefore, economic benefits. Trying to quantify these using economic models can be open to bias since numerous assumptions go into such models. The assumption, instead, is that the HAM and item rate would provide similar service at similar maintenance cost. It may be pertinent to say that, in this case, the approach is on the conservative side.

The model also moves away from an NPV approach to a nominal figure approach, replacing time value of money by cost of borrowing. After all, the government can borrow money to do the project itself, instead of making deferred payments to the private sector. In case of item-rate projects, investment in a project can deprive other projects from investment, and there are limits to the government's ability to borrow to finance all projects. The point is twofold: (i) discount the inherent incentive of off-balance-sheet borrowing, and (ii) enhance the focus on efficiency rather than on deferred payment.

Traditional VFM practices conduct the entire VFM exercise from the "government only" point of view, i.e., how much government would pay in both procurement routes. However, this paper takes the approach of net benefit to government as well as users. Clearly, the government needs to optimize resource allocation to provide the desired level of service to users and keeping the users out of the consideration is not warranted. If this were not the case, the lowest bid can erroneously be seen as providing the best value, even if it ends up delivering suboptimal quality services to users.

Finally, the purpose of traditional VFM approaches is to provide a "go or no-go" recommendation. However, the approach of this paper is to understand how efficiency drivers can deliver better value.

Overall, the approach moves away from assessing "how inefficient item-rate contracts are" to "how efficient HAM contracts can be." For understanding, it may be appropriate to call this approach "Value to Taxpayers' Money."

A. Design Efficiency and Early Delivery

For the purpose of this paper, the attempt is to quantify the impact of two efficiency drivers: (i) design efficiency and (ii) early delivery; to see how the HAM contracts fare in comparison to item-rate formats.

1. Design Efficiency

On the design side, there are further two categories: (i) design efficiency that is internalized before the bid, and (ii) design efficiency that is internalized after the bid. Clearly, the latter primarily

benefits only the concessionaire as the quotes have been frozen with the bids and the government is obligated to pay if concessionaire delivers on output specifications. The former, however, tends to benefit the government and taxpayers as the efficiency is internalized and translates into reduced bid prices. A proxy measure to valuing such efficiency prior to bid would be the comparison of discounts or premiums offered in the EPC contracts against those offered in the item-rate contracts. Data shows that the EPC contracts, on average, have been bid out at a discount to government estimates, whereas item-rate contracts are bid out at a premium (Appendix 2). Relatively speaking, design efficiency in the EPC allows contractors to be cheaper than item-rate contracts.

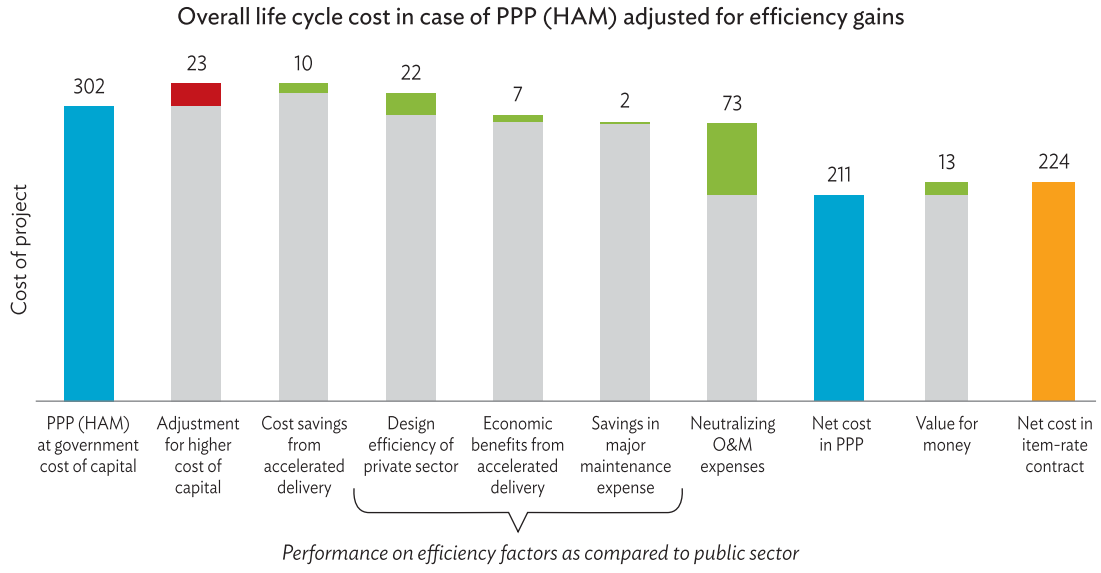
2. Early Delivery

Data on early delivery in the HAM and item-rate contracts is available; however, in the case of HAM, the number of data points is low. While national-level HAM projects are in progress and scheduled completion dates are yet to be reached, several state-level HAM projects have been completed. Data shows that the HAM projects have been completed 14% before the target period, whereas item-rate contracts have been completed with 21% delay (Appendix 3). Effectively, the HAM projects are completed 35% ahead of their item-rate counterparts.

B. Quantitative Deconstructing of HAM Costs and Benefits

To better understand HAM costs, it is useful to know how each element can be examined. This deconstruction of costs and benefits is indicated in Figure 7.

Figure 7: Deconstructing the Hybrid Annuity Model Costs and Benefits
($ million)



HAM = hybrid annuity model, O&M = operation and maintenance, PPP = public private partnership.
Source: Calculations by authors.

1. Project Cost Assuming Government Cost of Capital

The process of deconstruction of the initial project cost begins with the premise that the government can deliver the same HAM project with financing procured at the government's cost of capital. For benchmarking the cost of capital for government, the proposed cost of borrowing at which the NHAI would be raising taxable bonds has been considered.[35] The model assumes that the government procures construction grant through bond issuance with a coupon rate of 8.75%. For a project with an assumed construction cost of $100 million under a traditional item-rate contract, the total (aggregated) government outflow is $302 million over a period of 15 years.

2. Project Cost Assuming Private Cost of Capital

However, if the private sector delivers the project instead of the government, the cost of capital would be higher owing to obvious financial costs and credit risks. Although the cost of debt for private borrowers in the domestic market depends upon the credit rating of the firm, on average, the interest rate for credible private sector borrowers ranges between 10% and 11% per year for Hybrid Annuity projects, and this is approximately 1%–2% above the government's Cost of Capital.[36] Furthermore, the cost of equity, computed using Capital Asset Pricing Model, is estimated to be 15.69% per year.[37] Based on these assumptions, the net impact on government outflow due to higher cost of capital in the HAM has been estimated to be about $23 million.

3. Design Efficiency Driving Value

Item–rate contracts are prone to time and cost overruns, besides recurring disputes involving claims and escalations. The main causes include inadequate project estimations and allocations of several construction risks to the government, which may be better managed by the private sector. The EPC contracts, on the other hand, function on "what" needs to be done rather than "how" it is to be done, which provides the requisite flexibility to the Contractor in adopting innovative design at an efficient price.[38]

The HAM is like the EPC in terms of design risk transfer to the concessionaire. The design efficiency can arise in two parts: one part is that which is thought of before the bid process and can be internalized through lower bid prices, and the second part is thought of after the bid process, in which case benefits accrue to the contractor. For the quantification of VfM derived from design efficiency, which is also internalized in bid prices, a comparative analysis of estimated project cost and tender cost has been carried out for 30 EPC projects. As per analysis based on data-driven evidence, savings in net government outflow in the HAM (due to design efficiency) has been estimated to be about $22 million.

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35 S. Das. 2018.

36 Interest Rate on loans availed by concessionaires for financing debt in Hybrid Annuity projects is between 9% and 11% depending upon the credit profile of the borrower group. https://prime.economictimes.indiatimes.com/news/64290974/infrastructure/bharatmala-heads-for-a-bumpy-ride (accessed 1 June 2019).

37 NIFTY return for the last 18 years: 13.72%. Risk Free Rate: 7.39%. Average Beta Value for comparable infrastructure companies has been computed to be 1.31.

38 Model EPC Agreement prepared by Planning Commission, deliberated by a High-powered Working Group in fiscal year 2017 (NITI Aayog).

4. Early Completion of HAM Projects as Compared to Item-Rate Contracts

Item-rate and HAM contracts both have provision for indexing costs to inflation. However, reduced delays in the HAM can reduce losses to funds due to triggering of price-escalation payments. Based on a detailed analysis of 30 infrastructure projects (carried out in the cited study), it has been observed that average time overrun in item-rate contracts is only 23.04% as compared to 6.84% in PPP contracts.[39] The same trend has been observed in current sample where the time overrun for 95 item-rate contracts has been compared to seven HAM contracts. The time overrun in item-rate contracts has been computed to be 6 months as compared to a negative (-) 3 months for HAM contracts (project completion before time). The corresponding savings from accelerated delivery derived from reduced payout on account of price escalation in PPP (HAM) has been estimated to be $10 million.

5. Benefit to Users Due to Early Availability of Assets

As discussed previously, HAM projects get completed about 9 months ahead as compared to item-rate contracts, thereby allowing users to benefit from a longer asset availability. There are various methodologies available to quantify the economic gain accruing to the users. In this paper, quantification of benefits is based on the Method for Impact Assessment of Programmess and Projects (MAPP),[40] which assumes that the present value of benefits is either equal or exceeds the present value of costs for the project to be implemented. Time savings and user benefit arising due to faster delivery of assets in the HAM results in higher NPV to the government which, in turn, creates VfM. The value of gain in economic benefits due to accelerated delivery (by 9 months) is estimated to be $7 million.

However, in many cases, a delay in achieving financial closure for HAM projects has been observed. Data (as of March 2019) suggests that HAM projects are requiring more than 150 days to achieve financial closure.[41] A credit research house in India reported that a cautious approach of lending followed by the banking sector has led to reduced credit exposure to risky segments which includes under-construction projects. Hence, much of the benefit arising on account of early completion of HAM projects may get nullified due to greater amount of time required for financial closure. Therefore, it is important to ensure the execution capacity of the contractor, coupled with project preparedness. Failure to do so would mean erosion in benefits attributed to HAM projects.

Hence, by combining the design efficiency and higher user benefits due to early availability, it may be seen that the total value of the benefits accruing to the authority ($32 million) is higher than the incremental private cost of capital ($23 million).

6. Neutralization of Operation and Maintenance Expense

The cost of procurement of an HAM project explicitly assumes that O&M obligations of the road would be undertaken by the concessionaire over the operations period, and the sum of payments (O&M payment plus interest) compensates the concessionaire for undertaking these obligations. Hence, for comparison of construction cost of PPP and item-rate contracts, the O&M expenses should be deducted from the total life-cycle costs of a PPP HAM project for neutral comparison with

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39 Kakati and Baruah (2016).

40 European PPP Expertise Centre. 2011. The Non-Financial Benefits of PPP: A Review of Concepts and Methodology.

41 Hindustan Times. https://www.hindustantimes.com/india-news/fund-crunch-stalls-road-projects-as-new-model-faces-old-problems/story-chgp0m4Dqp4TqFCkZ1foeJ.html (accessed 25 June 2019).

an item-rate contract. The sum of periodic and routine maintenance for the HAM project has been estimated to be $73 million, thereby resulting in net cost of construction, including financing cost, amounting to $211 million. Differentiating roads maintained through direct government contracts as against the HAM would be contentious and in the absence of objective data. For simplicity of assessment, it is therefore assumed that both the government and private sector would maintain the road at comparable service levels.

7. Incorporating the Cost of Capital in Item-Rate Contract

The government and its agencies have access to budgetary provisions as well as funds raised from the market for funding construction and operational expenditure.[42] For example, the NHAI has already signed a $3.5 billion (in rupee equivalent) loan agreement with State Bank of India. Similarly, it is also raising about $1.3 billion (in rupee equivalent) in the form of bonds at a tentative interest rate of 8.50%–9.00% in 2019.[43] Hence, for the current analysis, it has been assumed that the government agency undertaking the item-rate project under analysis would also raise a bond at a coupon rate of 8.75% for 15 years for financing the item-rate contract. The risk-adjusted cost of project (with base cost of $100 million) has been estimated to be $119 million. Based on the assumptions highlighted, the total nominal outflow for the project, including the coupon and principal payments, would be $224 million.

8. The Result: There Is Positive Value for Money

Considering all these factors, and comparing the total cost of implementation of a road project on item rate and PPP (HAM) basis reveals that VFM to the extent of 13% accrues to the government on account of implementation of project on an HAM basis.

C. Quality Is a Definite Differentiator

In addition to the quantitative benefits, the quality of road projects is higher for PPP projects. Because the HAM is a recent variation to the existing PPP contract, reliable data on its asset quality is difficult to obtain. Since asset quality is an output specification and does not depend on the variation in payment mechanisms, a comparative analysis of asset quality of PPP projects and comparable item-rate contracts has been done as a proxy for the HAM. As an example, the historical data on International Roughness Index (IRI) and traffic data, mentioned below, illustrates that PPP projects, despite having higher traffic, have been able to maintain better values of IRI in comparison to their item-rate counterparts.

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[42] NHAI Annual Report 2016-17 (Schedules form a part of Balance Sheet) shows the sources of funds for it, comprising of its own share capital, reserves and surpluses, grants received from Central Government, grants for externally aided projects, capital gains tax free bonds, taxable bonds, and loans from multilateral agencies.

[43] Business Standard. *NHAI initiates process to tie up Rs 40 billion through a bond issue.* https://www.business-standard.com/article/economy-policy/nhai-initiates-process-to-tie-up-rs-40-billion-through-a-bond issue-118080901835_1.html (accessed 26 June 2019).

Table 3: Comparative Analysis of Asset Quality of PPP Projects

Roads (PPP)	Construction Year	IRI in 2010	PCUs in 2010	
Bangalore–Maddur (PPP Annuity)	2006	2.7	21,445	Higher traffic but asset deterioration controlled

Roads (non-PPP)	Construction Year	IRI in 2010	PCUs in 2010	
Mudgal–Hungund	2006	4.3	446	Lower traffic but higher asset deterioration
Shedbal–Sankeshwar	2006	3.4	9,804	
Alnawar–Yellapur	2006	2.5	2,072	

IRI = international roughness index, PCU = passenger car unit, PPP = public–private partnership.
Source: National Highways Authority India.

PPP projects have contractual obligations with respect to transfer/handover, which mandates the Concessionaire to maintain the road as per the Maintenance Requirements included in the Concession Agreement. Deterrents in the form of retention of annuity payments are provisioned in the contract, which ensures that the concessionaire maintains the roads as per requirements.

Table 4: Sample Contract Provisions on Retention of Annuity Payments

Tuni Anakapalli Annuity Road Project	Delhi Gurgaon Expressway	Draft Concession Agreement for PPP (HAM)
An Independent Engineer certifies the quality of the road. The National Highways Authority of India ensures the Concessionaire, before handover, undertakes the requisite repairs, by retaining a sum of ₹74 million from four annuity payments immediately preceding the expiry of the Concession Period.	As per the Concession Agreement, a joint inspection shall be conducted, not less than 30 months or more than 36 months prior to the expiry of the Concession Period. Two years prior to the expiry, an amount equivalent to the fees realized for a traffic volume of 10,000 PCUs/day for the last 2 years or higher based on certification from the IC shall be retained in an escrow account for renewal works.	The Concessionaire shall be responsible for all defects and deficiencies in the Project for a period of 120 days after Termination, and it shall have the obligation to repair or rectify, at its own cost, all defects and deficiencies observed by the Independent Engineer in the Project during the aforesaid period. Sum equal to 15% (fifteen percent) of the Annuity Payment due and payable immediately preceding the Transfer Date shall be retained in the Escrow Account for a period of 120 days after Termination for meeting the liabilities.

₹ = India rupee, HAM = hybrid annuity model, PCU = passenger car unit, PPP = public–private partnership.
Source: National Highways Authority India.

With provisions built in the contract, the handover of quality asset at the end of concession period is expected to minimize premature deterioration and thus result in additional savings to the government. Assuming a delay in conducting periodic maintenance by 3 years, net benefit to the government is estimated to be $2 million. The net benefit would accrue because of higher savings in financing cost of major maintenance loan to be availed by the government versus loss due to impact of inflation on deferred major maintenance. Thus, delay in conducting periodic maintenance due to higher asset quality in PPP (HAM) is likely to increase VFM in PPP (HAM) projects.

Reforming procurement methodologies and creating a culture of contractual incentives is one way to improve value, among others. While these initiatives are still work in progress, a significant benefit accruing is in the use of output specifications and payment mechanisms to drive performance. Output specifications, coupled with targeted payment mechanisms, can unlock significant value including improved safety, congestion management, reduced disruption during construction, and reduced environmental impact.

VI. OBSERVATIONS AND CONCLUSION

In general, it is almost axiomatic to assume that PPP brings in better VfM for the government and users by way of design efficiency, better implementation, and better asset management while crowding-in private capital. On the other hand, in the Indian context, there is scant data to assess the value construct and take an objective view on the PPP paradigm for the road sector. In this paper, an attempt is made to quantify VFM for the HAM. This is done by deconstructing the HAM costs into various constituents, either empirically or through assessments based on commercial assumptions.

A. Observations and Thoughts on Hybrid Annuity Model

Based on available empirical evidence, the key finding is that the HAM, in its current format, does offer VFM, even though the quantum cannot be termed very high. In fact, increase in capital cost of the private sector, environment and scope of works, and limitations of efficiency drivers can affect VFM attained in projects on a case-to-case basis.

The HAM quantitatively delivers value after factoring in the impact of higher cost of capital, through design and implementation efficiency. In addition, contractual provisions in the concession agreements mandate the concessionaire to maintain the asset quality, thereby ensuring relatively higher VFM. Qualitative aspects, such as better standards of asset management, are also to be acknowledged. Road maintenance is locked into pre-contracted HAM obligations, whereas in the conventional cases, there would be uncertainties in budgetary allocations and maintenance programming. The limitation of this paper, however, arises from the fact that the HAM is a relatively recent phenomenon and, therefore, the data available is on a smaller number of projects and only indicative of early evidence. The subject will be revisited in subsequent years, when more data points are available and ADB-assisted projects also enter the maintenance phase.

Having said that, there is significant scope in retuning the entire HAM procurement and "readiness" process to maximize VFM. For example, qualification criteria need a significant relook to enable awarding projects to bidders that measure up to the capacity. Having the right bidders with the right capacity will enable reduced cost of capital and perhaps better delivery of the project. Land acquisition and statutory clearances need to be substantially in place prior to, or during, procurement. Delays will negate the VFM of the HAM arrangement.

Creating an enabling environment for international firms to participate in projects in India is important. Ease of Doing Business for the infrastructure sector and creating an equal opportunity on supply-chain side would help in extracting more value. The government can facilitate access to finance and capacity building to gradually build a pool of qualified firms. This benefit would be possible not only for HAM projects, but, ultimately, for other models of PPP as well.

The current HAM format focuses on asset creation and maintenance, rather than providing an acceptable level of service to users. Tailoring payment mechanisms to deliver a certain anticipated benefit, e.g., congestion management, road safety, disruption management, and journey time reliability, should also be examined.

Asset productivity becomes an important driver of efficiency in long-term contracts. However, stand-alone linear projects may have limited capability to maximize asset productivity. Network contracts through the HAM that follows a cluster approach may provide a better VfM.

A model-choice methodology is required to differentiate projects that should use the HAM from those that should not. Overuse of the HAM can have implications of lower VfM as well as reduced fiscal space in future. Unless the public sector has the right understanding of a project's risk profile and the project is targeting specific benefits to users that the private sector can deliver, the HAM may not be the best approach.

Finally, the participation of development institutions, such as ADB, will be an effective measure of credit enhancement to the HAM transaction. In particular, the perceived risk of default on annuity payments at the state level could be largely mitigated, because the federal and state governments are both subject to the financing agreement with development institutions. For the government, the financing from development institutions can help convert the large capital investment in a short term into a predictable long-term cash flow.

B. Beyond Value for Money

In addition to VfM, the introduction of the HAM has promoted some interesting changes in road transport. The following aspects can be considered as the development impacts directly catalyzed by the new contract modality.

1. Efficiency and Capacity of Road Agencies

Usually, HAM-based concession agreements specify the schedule of transferring the right-of-way to concessionaires, in accordance to the plan of land acquisition and resettlement, environmental clearance, utility shifting, and other preconstruction activities. As for traditional item-rate contracts, the efficiency and time of accomplishing these prior readiness activities is a major factor affecting the timely completion of construction. Under HAM-based concession agreements, most delays in preconstruction activities will have direct implications to the payment by the government, and thus will be more visible and measurable to the public. Road agencies and other related government agencies must improve their own efficiency to catch up with the efficiency brought in by the private sector and merely adopting HAM does not.

2. Revenue Generation

With the introduction and mainstreaming of PPP, the public acceptance of road user charges is gradually increasing. When the level of services in road transport becomes measurable in monetary terms, the capacity of the road sector to raise more revenue to fund itself will have better chances to increase. Most HAM-based concession agreements already include provisions for constructing toll plazas. Although the risks related to toll revenue is not allocated to the private sector, the government now has the opportunity to receive additional revenue and allocate the resource across the network.

3. Road Asset Management and Sustainability

With improved capacity to generate revenue, the road sector now can adopt better practices of road asset management for sustainability. The introduction of the HAM, among other PPP modalities, essentially converted the role of road agencies from asset manager to asset owner. As the representative of taxpayers' interests, the government can focus on the level of services such as road conditions, roughness, and responsiveness to emergency and accident, etc., while the technical planning and execution of O&M activities can be left to the concessionaire.

4. Road Safety

Among others, the current HAM template has incorporated provisions for road safety auditing and requirements, which is a major and far-reaching improvement compared to past practices. Moving forward, the implementation arrangements and performance specifications can be further developed, but the provisions allow road agencies to become the real owner of road safety since the performance is linked to financial implications.

5. Toll, Hybrid Annuity Model, or Engineering, Procurement, and Construction?

The question, "How does one pick a concession model?" is one of many that need to be considered and answered. This is quite difficult and, in the past, the Government of India has used a prioritized decision structure: (i) If the project's financial model, in sensitivity cases of cost and traffic, still gave a minimum debt service coverage of more than 1 and an equity return of over 18%, then toll-based concessions were the first priority. Viability gap fund could be used to support these projects. (ii) If a project did not stand viable under toll, then an annuity or HAM structure could be used. A cap of 18% was placed on the return on equity, and if bids were higher, then the next priority of the EPC with extended maintenance payments was used. This construct still serves as a useful guide despite some limitations, since the numbers are empirically and somewhat subjectively selected.

Such a selection process for the preferred mode of contracting is much needed. As pointed out in section II.B, the option of deferment of payment for projects to leverage larger resources may become an easy option for the governments, but there are risks of such "off-balance sheet financing." There must be control mechanisms and objective criteria for the selection of projects. Otherwise, future governments and future taxpayers would be left with the burden to service the annuity payments for economically unviable projects.

APPENDIX 1: COMPUTATION OF RETURN ON EQUITY FOR INFRASTRUCTURE SECTOR

Sl. No.	Company Name	Levered Beta	Debt–Equity Ratio	Unlevered Beta	Debt–Equity Ratio
1	L&T India	1.36	1.51	0.67	1.512
2	Reliance Infrastructure	2.08	0.71	1.40	0.711
3	Ashoka Buildcon Ltd	0.72	12.04	0.08	12.045
4	NCC Urban Hyderabad	2.18	0.41	1.70	0.420
5	Patel Engineering Ltd	1.35	1.29	0.72	1.296
6	Gayatri Projects Ltd	1.48	2.39	0.56	2.392
7	Ramky Infrastructure Ltd	2.16	4.56	0.53	4.561
8	Sadbhav Engineering Limited	1.70	8.48	0.25	8.487
9	Simplex Projects Ltd	2.14	4.74	0.51	4.743
10	Shriram EPC	0.88	0.64	0.61	0.645
11	KNR Constructions Ltd	1.05	0.67	0.72	0.676
12	JMC Projects (India) Ltd	1.61	3.11	0.52	3.114
13	Petron Engineering and Construction Limited	1.63	10.11	0.21	10.113
14	RPP Infra Projects Ltd	0.66	0.33	0.54	0.339
15	SPML Infra Ltd	1.49	2.90	0.50	2.907
16	Vascon Engineers Ltd	1.51	0.29	1.26	0.298
Average value of unlevered beta				0.67	
Average value of debt–equity ratio					1.390

Source: NSE India. https://www.nseindia.com/products/content/equities/indices/historical_total_return.htm (accessed 15 May 2019).

Computation of Levered Beta

$$\beta_{levered} = \beta_{unlevered} * (1 + (1- \text{tax rate}) * \text{Debt- Equity ratio})$$

Considering Tax rate as 32% and Debt–Equity Ratio as 1.39, $\beta_{levered}$ is computed to be 1.31.

The return on equity on the NIFTY and BSE SENSEX for the last 18 years (from 1 April 2000 to 15 April 2019) had been 13.72%.[1]

Using the Capital Asset Pricing Model, the required return on equity for the infrastructure sector is computed to be 15.69%.

[1] NSE India. https://www.nseindia.com/products/content/equities/indices/historical_total_return.htm (accessed 15 May 2019).

APPENDIX 2: VARIATION IN BIDS IN NATIONAL HIGHWAYS AUTHORITY OF INDIA (HYBRID ANNUITY MODEL) PROJECTS

Project	State	Length (km)	Expansion	Total Lane-Km	Year	TPC (in Rs Cr)	Tender Cost (in Rs Cr)
Four lane Porbandar - Dwarka	Gujarat	116.240	4L	464.960	2018	1,442.73	1,600.00
Four laning of Waranga to Mahagaon	Maharashtra	66.900	4L	267.600	2017	1,059.73	1,027.35
Six laning of Handia-Varanasi	Uttar Pradesh	72.400	6L	434.400	2017	2,064.99	2,447.00
Bhavnagar-Talaza	Gujarat	48.000	4L	192.000	2016	802.00	819.00
Binjabahal-Telebani	Odisha	78.310	4L	313.240	2016	585.07	1,161.40
Bodhre-Dhule	Maharashtra	67.200	4L/6L	268.800	2017	744.64	874.19
BRT Tiger Reserve	Karnataka	174.100	4L	696.400	2016	799.53	1,008.00
Dausa - Lalsot-Kauthun	Rajasthan	83.500	2L/4L	167.000	2016	688.71	774.00
Davanagere-Haveri	Karnataka	78.923	6L	473.538	2017	993.70	1,177.00
Delhi-Meerut Exp	Uttar Pradesh and Delhi	96.000	6/8L	576.000	2015	1,401.93	2,070.00
Four laning of Jhansi-Khajuraho section (Pkg-I)	Uttar Pradesh and Madhya Pradesh	76.300	4L	305.200	2017	1,053.41	1,406.00
Four laning of Jhansi-Khajuraho section (Pkg-II)	Uttar Pradesh and Madhya Pradesh	85.400	4L	341.600	2017	1,001.62	1,295.94
Four laning of Mahagaon to Yavatmal	Maharashtra	74.990	4L	299.960	2017	1,098.06	1,160.31
Four laning of Wardha-Butibori	Maharashtra	59.200	4L	236.800	2017	1,030.44	1,065.51
Four laning of Yavatmal to Wardha	Maharashtra	64.920	4L	259.680	2017	988.34	1,188.00
Gadu-Porbandar	Gujarat	93.560	2L/4L	187.120	2017	401.95	370.00
Gagalehri-Saharanpur-Yamunanagar	Uttar Pradesh and Uttarakhand	51.000	4L	204.000	2016	1,009.36	1,184.00
Kagavadar-Una	Gujarat	40.600	4L	162.400	2016	535.71	545.00
Kashedi- Parshuram Gha	Maharashtra	43.800	4L	175.200	2016	585.07	579.00
Kharar Ludhiana	Punjab	76.000	6L	456.000	2016	1,388.34	1,600.00
Kodinar Veraval	Gujarat	41.600	6L	249.600	2016	614.00	670.00
Kishangarh-Udaipur-Ahmedabad (KUA) - Pkg-VI	Rajasthan	93.000	6L	558.000	2016	1,092.00	1,210.00
Laddowal Bypass	Punjab	17.000	4L	68.000	2016	370.17	392.00
Lucknow-Sultanpur	Uttar Pradesh	127.000	4L	508.000	2016	1,661.94	2,016.00
Mahuva - Kagavadar	Gujarat	40.020	4L	160.080	2016	599.74	604.68

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Appendix 2 *continued*

Project	State	Length (km)	Expansion	Total Lane-Km	Year	TPC (in Rs Cr)	Tender Cost (in Rs Cr)
Nagpur ring road Pkg 1	Maharashtra	33.500	4L	134.000	2016	495.00	531.00
Nagpur ring road Pkg 2	Maharashtra	28.035	4L	112.140	2016	547.99	627.77
New link (NH-133B) from km 0.000 (km 200.87 of Sahibganj Bypass)	Jharkhand	15.885	4L	63.540	2017	1,905.55	2,598.00
Parshuram Ghat - Arawali	Maharashtra	35.900	4L	143.600	2016	560.85	670.00
Phagwara - Rupnagar	Punjab	81.000	4L	324.000	2016	1,169.61	1,367.00
Salasar - Nagaur	Rajasthan	119.600	2L	239.200	2016	532.43	455.00
Shimla Bypass of NH-22	Himachal Pradesh	28.000	4L	112.000	2016	1,150.00	1,480.00
Singahara - Binjabahal	Odisha	103.790	4L	415.160	2017	1,097.00	1,561.00
Six laning of NH-16 from Ranastalam to Anandapuram	Andhra Pradesh	47.000	6L	282.000	2017	1,041.62	1,187.10
Six laning of Chitradurga – Davanagere	Karnataka	72.700	6L	436.200	2017	993.16	1,434.00
Six laning of Davanagere – Haveri	Karnataka	78.920	6L	473.520	2017	993.70	1,177.00
Six laning of Hubli – Haveri	Karnataka	63.400	6L	380.400	2017	998.98	1,134.00
Talaja - Mahuva	Gujarat	45.460	4L	181.840	2016	613.00	643.05
Tars`od - Fagne - Pkg 2B	Maharashtra	87.000	4L	348.000	2016	897.45	1,021.00
Tuljapur - Ausa	Maharashtra	55.835	4L	223.340	2017	905.00	911.07

HAM = hybrid annuity model, km = kilometer, L = lane, NHAI = National Highways Authority India, Pkg = package, TPC = total project cost.
Note: Amounts in Rs. Cr: Rupees. 1 Crore = Rupees 10 million.
Source: National Highways Authority India.

APPENDIX 3: DATA RELATED TO TIME/COST OVERRUN OF ITEM-RATE CONTRACTS

Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
1	Kalmala to Sindhanur (U1)	KSHIP	76.000	67.82	23 Jan 02	23 Jul 04	15 Mar 06	13.74	3.59	66	5	20
2	Sindhanur to Budugumpa (U2)	KSHIP	78.000	71.87	23 Jan 02	23 Jul 04	22 Sep 05	4.42	2.52	47	4	6
3	Hulikatti to Nargund (U10)	KSHIP	21.000	19.62	9 Mar 05	8 May 06	15 Jul 08	–1.03	1.54	188	8	(5)
4	Hiriyur to Bellary (U11)	KSHIP	144.000	269.01	28 Mar 03	28 Mar 06	31 Jul 06	–31.69	4.47	11	2	(12)
5	Lingsugur to Hattigudur (M13)	KSHIP	68.200	15.87	18 Feb 02	17 Dec 03	31 Oct 05	0.60	0.79	103	5	4
6	Sindhanur to Lingasugur (M12)	KSHIP	52.000	11.37	23 Jan 02	22 Sep 03	31 May 04	0.83	–1.12	42	(10)	7
7	Shedbal to Shnakeshwar (M4)	KSHIP	56.000	12.27	19 Feb 02	18 Dec 03	2 May 06	5.13	0.00	130	0	42
8	Athani to Shedbal (M3)	KSHIP	49.510	13.12	19 Feb 02	18 Apr 03	30 Mar 04	0.00	-1.43	82	(11)	0
9	Kavital to Mudgal (M31)	KSHIP	52.460	19.55	17 Jul 03	16 Feb 05	22 Oct 05	1.32	0.38	43	2	7
10	Bijapur to Krishna Bridge (U7A)	KSHIP	48.100	51.11	14 May 04	13 Nov 06	19 Sep 07	0.00	1.30	34	3	0
11	Krishna Bridge to Lokapur (U7B)	KSHIP	55.630	67.61	14 May 04	13 Nov 06	19 Jun 07	0.00	–2.86	24	(4)	0
12	Sindhanur to Lingasugur (M12)	KSHIP	58.900	23.87	10 Feb 04	9 Dec 05	15 Jun 06	3.18	–0.97	28	(4)	13
13	Yellapur to Sirsi (M25)	KSHIP	50.350	20.21	27 Jun 05	26 Dec 06	31 May 09	0.00	–2.30	162	(11)	0
14	Mysore to Mananthwadi (M32)	KSHIP	58.900	23.87	10 Feb 04	9 Dec 05	15 Jun 06	1.84	0.37	28	2	8
15	Alnavar to Yellapur (M24)	KSHIP	57.100	24.4	20 Feb 04	19 Nov 05	23 Dec 06	–1.25	0.80	63	3	(5)
16	Kumbarawada to Sadashivagada (M27)	KSHIP	64.100	19.31	7 Mar 05	6 Mar 06	18 May 09	–5.78	1.88	321	10	(30)
17	Devinagar to Sindhanur (M11)	KSHIP	42.900	25.1	16 Jun 05	15 Sep 06	31 Oct 07	2.80	0.00	90	0	11
18	Bellary to Devinagar (M10)	KSHIP	39.630	19.92	18 Jul 03	17 Oct 04	13 Nov 05	1.46	0.00	86	0	7
19	Navalgund to Ron (M33)	KSHIP	44.350	27.01	9 Mar 05	8 Aug 06	27 Dec 07	–2.90	5.67	98	21	(11)

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Appendix 3 *continued*

Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
20	Kalmala to Kavital (M30)	KSHIP	50.000	21.22	17 Jul 03	16 Jan 05	19 Aug 06	2.78	1.01	106	5	13
21	Srirangapatna to Chinya (M5)	KSHIP	32.000	15.68	21 Jun 05	20 May 06	30 Dec 06	4.32	0.00	67	0	28
22	Mariammanahalli to Kallubavale (M14)	KSHIP	52.950	31.48	14 Oct 04	8 Jul 06	30 May 07	–6.09	0.84	52	3	(19)
23	Huliyar to Hiriyur (M9)	KSHIP	48.650	26.98	28 Dec 04	28 May 06	31 Mar 07	–1.85	0.00	59	0	(7)
24	Chinya to Nelligere (M6)	KSHIP	33.000	14.76	29 Nov 05	28 Oct 06	15 Jul 07	5.30	0.00	78	0	36
25	Nelligere to Kibbanahalli (M7)	KSHIP	47.000	19.61	7 Nov 05	6 Jan 07	6 Jun 07	4.18	0.00	36	0	21
26	Sindhanur to Budugumpa (U2)	KSHIP	78.000	71.87	23 Jan 02	23 Jul 04	22 Sep 05	4.42	2.52	47	4	6
27	Lingsugur to Hattigudur (M13)	KSHIP	68.200	15.87	18 Feb 02	17 Dec 03	31 Oct 05	0.60	0.79	103	5	4
28	Dharwad-Belgaum (KT) NH 4 Pkg-III	NHAI	62.000	209.74	1 Apr 02	1 Nov 04	1 Jun 07	0.59	82.47	100	39	0
29	Pallikonda -Ranipet (Km 100-145) Pkg-KR-3	NHAI	45.000	229.6688	1 Oct 01	1 Apr 04	1 Jan 06	10.53	56.45	70	25	5
30	Poonamlee-Kanchipuram (Km 70.20-13.80) Pkg-RC-1	NHAI	56.400	222.22	1 Jul 01	1 Dec 03	1 May 07	45.64	0.00	141	0	21
31	Dhankuni-Kolaghat WB-I	NHAI	54.400	414.05	1 Mar 99	1 Nov 01	1 Nov 01	6.91	67.96	0	16	2
32	Kolaghat-Kharagpur NH-6 WB-II	NHAI	60.450	378.4	1 May 01	1 Mar 04	1 Mar 07	3.43	43.93	106	12	1
33	Laxmannath-Kharagpur WB-IV	NHAI	65.860	337.34	1 Jun 01	1 Mar 04	1 Jun 06	10.99	9.11	82	3	3
34	Chandikhol-Bhadrak OR-II	NHAI	75.500	247.88	1 Dec 00	1 Dec 03	1 May 05	27.20	39.58	47	16	11
35	Balasore-Laxmannath OR-IV	NHAI	53.410	257.9824	1 Mar 01	1 Dec 03	1 May 07	0.19	10.58	124	4	0
36	Srikakulam-Palasa (Km 97-Km 171) AP-II	NHAI	74.000	219.6	1 Jun 01	1 Jan 04	1 Jun 05	4.46	38.20	55	17	2
37	Kavali-Ongole (AP-12) Km 291 to 222	NHAI	72.000	279.1013	1 Aug 01	1 Apr 04	1 Sep 05	2.59	30.65	53	11	1
38	Ongole-Chilakaluripet (AP-13) Km 357.9 to 291	NHAI	66.000	247.75	1 Jun 01	1 Dec 03	1 Mar 06	2.06	36.06	90	15	1

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Appendix 3 *continued*

Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
39	Chennai - Tada (Km 52.8-11) TN-01	NHAI	41.800	201.9404	1 Jun 01	1 Dec 03	1 Dec 05	2.46	76.49	80	38	1
40	Bakaria - Gogunda (RJ-2)	NHAI	44.000	367.38	1 Nov 05	1 May 08	1 Mar 09	38.49	36.85	33	10	10
41	Gogunda - Udaipur (RJ-3)	NHAI	31.000	202.89	1 Jan 06	1 Jul 08	1 Dec 09	47.72	54.40	57	27	24
42	Ahmedabad-Vadodara Expressway-II	NHAI	49.900	270.59	1 Jun 01	1 Dec 03	1 May 04	14.58	55.81	17	21	5
43	Port Connectivity Pkg-VI (Paradeep Port)	NHAI	74.000	340.64	1 Feb 04	1 Feb 07	1 Jun 09	3.18	34.27	78	10	1
44	Shivpuri Bypass - MP/RJ Border (MP-1)	NHAI	53.000	263.72	1 Aug 05	1 Feb 08	1 Oct 08	15.07	18.15	27	7	6
45	Chittorgarh Bypass (RJ-6)	NHAI	23.750	314.22	1 Aug 05	1 Aug 07	1 Oct 09	0.39	39.63	108	13	0
46	Kota - Chittorgarh (RJ-7)	NHAI	63.000	364.64	1 Oct 05	1 Apr 08	1 Dec 08	4.14	21.15	27	6	1
47	RJ/MP Border - Kota (RJ-9) Km 406 to Km 449	NHAI	43.150	250.79	1 Oct 05	1 Apr 08	1 Jun 09	0.38	16.14	47	6	0
48	RJ/MP Border - Kota (RJ-10) Km 449 to Km 509	NHAI	59.850	310.417	1 Oct 05	1 Apr 08	1 Jun 09	5.13	22.97	47	7	2
49	RJ/MP Border - Kota (RJ-11) Km 509 to Km 579	NHAI	70.000	239.186	1 Sep 05	1 Mar 08	1 Oct 08	14.79	34.77	23	15	6
50	Gurgaon Kotputli (ADB Pkg-I)	NHAI	126.000	319.8191416	1 Mar 99	1 Mar 01	1 Mar 01	26.12	0.00	0	0	8
51	Tumkur-Haveri (Sira-Chitradurga) Pkg-II	NHAI	66.700	240.81	1 Mar 02	1 Aug 04	1 May 08	2.60	103.71	155	43	1
52	Garamore-Bamanbore (Km.254-182.60) of NH-8A, Pkg-III	NHAI	71.400	258.51	1 Feb 05	1 Nov 07	1 Jul 09	6.77	28.46	61	11	3
53	Radhanpur-Deesa (Km. 458-372.60 on NH-14), Pkg-VI	NHAI	85.400	345.03	1 Feb 05	1 Nov 07	1 Sep 08	29.89	0.00	30	0	9
54	Sikandra-Bhaunti (TNHP-1) Pkg.II-A	NHAI	62.000	237.19	1 Feb 01	1 Aug 04	1 May 07	0.00	60.05	79	25	0
55	Handia-Varanasi (TNHP-4) Pkg.III-C	NHAI	72.000	226.6	1 Mar 01	1 Jul 04	1 Apr 08	0.00	52.03	112	23	0
56	Mohania-Sasaram (TNHP-5) Pkg.IV-B in Bihar	NHAI	45.000	213.3564	1 Feb 01	1 Feb 04	1 Mar 06	3.17	25.24	69	12	1

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Appendix 3 *continued*

Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
57	Dehri-on-sone-Aurangabad (TNHP-6) Pkg.IV-D	NHAI	40.000	214.231	1 Feb 01	1 Feb 04	1 Nov 05	23.99	0.00	58	0	11
58	Aurangabad-Barwa-Adda (TNHP-7) Pkg.V-A [Aurangabad-Barachati]	NHAI	60.000	246.003	1 Sep 01	1 Mar 05	1 Jul 07	3.89	63.23	67	26	2
59	Shikohabad-Etawah (GTRIP-2) Pkg.I-B (Km 250.50-307.50)	NHAI	57.000	230.27	1 Sep 05	1 Sep 07	1 Sep 08	0.00	59.92	50	26	0
60	Etawah-Rajpur (GTRIP-3) Pkg.I-C (Km321.10-393)	NHAI	72.830	274.21	1 Mar 02	1 Mar 05	1 May 08	7.06	59.99	106	22	3
61	Sasaram-Dehri-on-sone (GTRIP-6) Pkg.IV-C	NHAI	30.000	206.7776	1 Mar 02	1 Mar 05	1 Jul 08	0.92	35.08	111	17	0
62	Allahabad Bypass Project (Pkg.ABP-II) (Km 158-198 on NH-2)	NHAI	39.000	423.15	1 Jun 04	1 Dec 06	1 Dec 09	7.10	89.84	120	21	2
63	Allahabad Bypass Project (Pkg.ABP-III) (Km 198-242.708 on NH-2)	NHAI	44.700	471.81	1 Nov 04	1 May 07	1 Dec 09	0.00	83.26	104	18	0
64	Upgradation of road from Chengannur to Ettumannur [Package No. UG-IV] WBR5	KSTP II	47.700	293.58	25 Nov 14	24 Nov 17	31 Mar 18			12		
65	PACKAGE KD-02	APRSP	52.700	133.54	01 Nov 14	31 Oct 16	Feb-19			113		
66	WAEP 3A Shimoga Shikaripura Anandapuram	KSHIP II	82.040	264.00	12 Aug 15	30 Apr 18	Nov-18			19		
67	WEP 5 – upgradation Chowdapur Gulbarga	KSHIP II	28.630	61.55	19 Jul 11	18 Jan 13	Nov-15			185		
68	WEP 1	KSHIP II	52.400	98.22	13 Aug 11	12 Feb 14	May-15			48		
69	WEP 3	KSHIP II	36.000	84.44	28 Jul 11	27 Mar 13	Dec-15			161		
70	WEP 4	KSHIP II	73.800	160.68	13 Aug 11	12 Aug 14	Jun-15			27		
71	Upgradation of road from Magadi (0+000) to NH-48 - Koratagere (68+200) in Link 64-C, D & E in Tumkur and Ramnagar Districts" (AEP-1)	KSHIP II	68.200	116.78	21 Mar 12	21 Dec 14	19 Jan 17			76		

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Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
72	Upgradation of the road from Pavagada (Km.0+000) to AP Border (Km 23+210) of SH-3 (AEP-2)	KSHIP II	23.210	43.30	29 Mar 12	28 Sep 13	21 Oct 15			137		
73	Upgradation of the road from Padubidri (Km.0+000) to Karkala (Km 27+800) of SH-1 (AEP-5)	KSHIP II	27.800	61.30	21 Mar 12	20 Sep 13	20 Nov 15			144		
74	Upgradation of the road from Mudgal (Km0+000) to Gangawathi (Km74+200) of SH-29 (AEP-8)	KSHIP II	74.200	152.60	26 Mar 12	25 Mar 15	22 Jul 15			11		
75	Upgradation of road from Laglur (km 0+000) to NH-13(km 9+250) of SH-45 and upgradation of road from SH-19 of KSHIP (Km 0+000) to Molakalmuru(km 5+130) of SH-2 (AEP-4)	KSHIP II	14.380	31.30	21 Mar 12	20 Jun 13	21 Oct 15			187		
76	Upgradation of the road from Shelvadi (Km.0+000) to Mundargi (Km 63+440) of SH-45c (AEP-7)	KSHIP II	63.440	121.30	21 Mar 12	20 Dec 14	07 Jul 16			56		
77	Rehabilitation and upgradation of Sheroinarayan-Birra-Champa Road (SH-9), (Package No.-16) ADB CG	CSRSP	51.790	119.07	20 Apr 15	19 Apr 17	27 Jun 18			59		
78	Rehabilitation and upgradation of Mungeli-Lormi, Lormi-Pandariya with Mungeli Bypass (37.007 Km.) (Package-18) ADB CG	CSRSP	37.000	81.86	13 Apr 16	12 Oct 17	16 Jul 18			51		

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Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
79	Upgradation of the road from Halagatti Junction, Ramdurga in Link 21D and from Badami to Badami Bypass Junction in Link 21E- Package (9B)	KSHIP II	45.000	146.05	04 Sep 15	03 Jun 17	15 Sep 18			74		
80	Upgradation from road from Badami Bypass Junction to Pattadakallu in Link 21E and Pattadakallu to Kamatagi Link 21F including additional length for Badami Bypass (2.19 Km) in Link 21E – Package (9C)	KSHIP II	43.130	110.90	24 Sep 15	23 Jun 17	16 Jun 18			56		
81	Upgradation of the road from Soundatti to Ramdurga in Link 21C and Ramdurga to Halgatti Junction, Ramdurga in Link 21D- Package (9A)	KSHIP II	38.465	138.25	25 Sep 15	24 Jun 17	24 Jul 18			62		
82	Rehabilitation and upgrading of Simga-Tilda-Kharora-Arang Road (SH-14) 57.15 KM P5	CSRSP	60.300	136.95	14 Apr 15	13 Apr 17	27 Jul 18			64		
83	Rehabilitation and upgrading of Rajnandgaon Kachche Road (SH-05) P8	CSRSP	77.120	172.76	18 Sep 15	17 Sep 17	26 Nov 18			60		
84	Rehabilitation and upgrading of Lairamnagar Mastu Ri Malhar Jondhra-Lawan Road (MDR) 52.939 KM P19	CSRSP	52.939	129.76	20 Apr 15	19 Apr 17	31 May 18			56		
85	Rehabilitation and upgrading Chattisgarh Road Sector Project – ADB – Package 1	CSRSP	36.500	102.89	14 Apr 15	13 Apr 17	01 Aug 18			65		

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Appendix 3 *continued*

Sl No.	Project	Authority	Length (km)	Tender Cost (INR Crores)	Date			Implication		Total Time Overrun (%)	Risk (%)	
					Start	Target Completion	Actual Completion	Variation (BoQ Quantity)	Design/Scope Change/ Extra Item		Design Risk	Quantity Variation Risk
86	Rehabilitation and upgrading Chattisgarh Road Sector Project – ADB – Package 2	CSRSP	35.580	93.79	14 Apr 15	13 Apr 17	26 Jul 18			64		
87	Rehabilitation and Upgrading Chattisgarh Road Sector Project– ADB – Package 3	CSRSP	43.480	122.61	14 Apr 15	13 Apr 17	24 Jul 18			64		
88	Package 4	CSRSP	49.040	124.07	08 Aug 15	07 Aug 17	28 Jul 18			49		
89	Package 6	CSRSP	61.440	132.98	14 Apr 15	13 Apr 17	24 Aug 18			68		
90	EPC-05 (Thiruchengode–Paramathi)	TNRSP II	26.200	103.81	22 Jun 15	20 Dec 17	16 Jan 18			3		
91	EPC-06 (Malliyakari–Rasipuram–Tiruchengode)	TNRSP II	50.530	224.06	23 Jun 15	22 Jun 18	23 Jul 18			3		
92	Package 5	KSTP II	40.600	171.49	04 Feb 14	02 Aug 16	Jul 18			77		
93	Four laning, widening and strengthening of Gurgaon-Nuh–Rajasthan border (SH-13) (km 7.200 to 95.890)	HSRDC	88.690	347.97	24 Jul 08	23 Jun 10	30 Jun 11			53		
94	Rohtak–Kharkhoda Delhi Border (Bhalaut Kharkhoda Delhi Border including Kharkhoda bypass) (SH-18). (km 10.200 to 40.760)	HSRDC	30.560	73.80	02 Jul 08	01 Oct 09	28 Feb 11			113		
95	Jhajjar to Farrukh Nagar Gurgaon, SH-15A	HSRDC	40.750	87.99	02 Jul 08	01 Jan 10	30 Sep 10			50		
96	Sonepat–Kharkhoda–Sampla road, SH-20	HSRDC	33.280	54.06	02 Jul 08	01 Jan 10	30 Sep 11			116		

( ) = negative, ADB = Asian Development Bank, AEP = Asian Development Bank Assisted Projects, APRSP = Andhra Pradesh Road Sector Project, BoQ = bill of quantities, CSRSP = Chhattisgarh State Road Sector Project, EPC = engineering, procurement and construction, HSRDC = Haryana State Roads and Bridges Development Corporation Ltd., INR = Indian rupee, km = kilometer, KSHIP = Karnataka State Highways Improvement Project, KSTP = Kerala State Transport Project, NH = national highways, NHAI = National Highways Authority of India, Pkg = package, SH = state highways, TNHP = Third National Highway Project, TNRSP = Tamil Nadu Road Sector Project, WEP = World Bank Assisted EPC Projects.
Note: Amount in Rs. Cr: Rupees 1 Crore = Rupees 10 million.
Source: National Highways Authority India.

APPENDIX 4: DATA RELATED TO TIME OVERRUN OF PUBLIC–PRIVATE PARTNERSHIP (HYBRID ANNUITY MODEL) PROJECTS

Sl No.	Project Name	Concession Agreement Signing Date	Scheduled Financial Closure Date	Actual Financial Closure/ Appointed Date	Construction Completion Date (as per Agreement)	Construction Completion Date (Actual)	Construction Period (Scheduled)	Actual Construction Period	Delay (%)
1	Development of Bagewadi–Bailahongal–Saundatti road (WCP-1)	9 Dec 2015	6 Jun 2016	3 Oct 2016	2 Oct 2018	1 Sep 2018	729	698	(4)
2	Development of Hassan–Arakalgud–Ramanathapura–Periyapatna road (WCP-3)	16 Dec 2015	13 Jun 2016	29 Sep 2016	28 Sep 2018	1 Feb 2018	729	490	(33)
3	Development of Hirekerur–Ranebennur road (WCP-5)	16 Dec 2015	13 Jun 2016	29 Sep 2016	28 Sep 2018	1 Feb 2018	729	490	(33)
4	Development of Mundaragi–Hadagali–Harapanahalli road (WCP-6)	16 Dec 2015	13 Jun 2016	29 Sep 2016	28 Sep 2018	1 Feb 2018	729	490	(33)
5	Development of Hungund–Muddebihal–Talikoti road (WCP-7)	9 Dec 2015	6 Jun 2016	3 Oct 2016	2 Oct 2018	1 Sep 2018	729	698	(4)
6	Upgradation of the road from Malavalli (km 0+000) to Pavagada (km 193+34) WAP 1	24 Mar 2014	20 Sep 2014	12 Dec 2014	31 Dec 2017	1 Feb 2018	1,115	1,147	3
7	Upgradation of the road from Mudhol (km 0+000) to Nipani (km 107+94) WAP 2	14 Mar 2014	10 Sep 2014	12 Dec 2014	11 Dec 2016	1 Jan 2017	730	751	3

( ) = negative, km = kilometer, WAP = World Bank Annuity Project, WCP = World Bank Co-Finance Project.
Source: National Highways Authority India.

APPENDIX 5: DATA RELATED TO TENDER DISCOUNT/PREMIUM IN ENGINEERING, PROCUREMENT AND CONSTRUCTION PROJECTS

Sl No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
1	Rehabilitation and upgradation of NH-214 (new NH-216) from km 0.0 to km 26.150 (Kathipudi to start of Kakinada bypass section) in the State of Andhra Pradesh to four lanes with paved shoulders under NHDP-IV on EPC basis	Andhra Pradesh	PIU MORTH Machilipatnam	Dilip Buildcon Ltd.	251.100	312.66	(20)
2	Construction and upgradation of existing road to 2-lane with paved shoulder from km 430.00 to km 468.00 of Chamoli to Paini under Chardham Pariyojna	Uttarakhand	BO Uttarakhand	NKG Infrastructure Limited	307.275	307.25	0
3	Construction, operation and maintenance of 2-Lane bi-directional Silkyara Bend-Barkot Tunnel with escape passage including approaches on Dharasu-Yamunotri section between Ch. 25.400 km And Ch. 51.000 km falling along NH-134 (OLD NH-94) in the State of Uttarakhand on EPC mode	Uttarakhand	BO Uttarakhand	Navayuga Engineering Co. Limited	853.800	853.79	0
4	Four laning of Jabalpur-Lakhnadon section of NH-7 from km 465.500 to km 546.425) in the State of Madhya Pradesh	Madhya Pradesh	PIU Jabalpur	Larsen & Toubro Ltd.	742.600	928.33	(20)
5	Four laning of Rewa-Katni-Jabalpur of NH-7 from km 397.000 to km 465.500 in the State of Madhya Pradesh (Package-IV)	Madhya Pradesh	PIU Jabalpur	Larsen & Toubro Ltd.	663.040	810.22	(18)
6	Development of six laning of Eastern Peripheral Expressway (National Highway No. NE-II) in the states of Haryana and Uttar Pradesh on engineering, procurement and construction (EPC) mode	Uttar Pradesh	PIU EPE	Jai Prakash Associates Ltd.	747.000	785.78	(5)
7	Construction of a new four lane extra dosed bridge from km 192.00 to km 198.00 between Vadodara-Surat section	Gujarat	PIU EPE	Larsen & Toubro Ltd.	379.000	407.54	(7)

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SI No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
8	Construction and upgradation of existing road to 2-lane with paved shoulder from km 368.000 to km 399.000 of Lameri to Karanprayag (excluding km 379.100 to km 380.275) of NH-07 under Chardham Pariyojna on EPC basis in the State of Uttarakhand	Uttarakhand	NHIDCL	M/s RCC Developers Limited	163.350	163.35	0
9	Construction and upgradation of existing road to 2-lane with paved shoulder from km 399.000 to km 430.000 of Karnaprayag to Chamoli (excluding km 420.250 to km 420.500 and km 423.300 to km 423.650) of NH-07 under Chardham Pariyojna on EPC basis in the State of Uttarakhand	Uttarakhand	ED-IV	M/s SCCPL - HCCPL (JV)		258.26	(100)
10	Construction and upgradation of existing road to 2-lane with paved shoulder from km 379.100 to km 380.275 of Gholtir landslide (design km 378.900 to km 380.075) of NH-07 under Chardham Paryojna on EPC basis in the State of Uttarakhand (design length – 1.175 km)	Uttarakhand			89.270	121.54	(27)
11	Four-laning of Ambala–Kaithal section of NH-65 from km 50.860 to km 95.360 (length 44.500 km) in the State of Haryana	Haryana			457.700	379.80	21
12	Upgradation of Kullu Manali section of NH-21 (now NH-3) from km 272.00 to km 309.345 (design change) on EPC mode in the State of Himachal Pradesh under NHDP Phase–IV B	Himachal Pradesh			213.000	218.47	(3)
13	Four-laning of Varanasi Gorakhpur section of NH-29 from km 12.000 to km 88.000 [Package -II from Sandah to Birnon] in the State of Uttar Pradesh under NHDP Phase-IV	Uttar Pradesh			852.320	856.64	(1)

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SI No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
15	Widening and strengthening of Barmer–Sanchor–Gujarat Border (up to Gandhav Bridge) section of NH- 15 to construction of service road in existing four lane from Ch. 153.000 to Ch. 157.000, two lane with paved shoulder from Ch. 157.000 to Ch. 245.505 and four lane from Ch. 245.505 to Ch. 259.300 under NHDP-IV in the State of Rajasthan	Rajasthan		M/s Montecarlo Ltd	343.800	420.33	(18)
16	Development and upgradation of Bijapur–Gulbarga–Homnabad section of NH 218 (new NH-50) to 2-lane with paved shoulders from km 195.000 to km 418.000 in the State of Karnataka under NHDP Phase-IV to be executed on EPC mode	Karnataka			759.000	709.00	7
17	Four laning of Chandigarh Kharar section from Sector 39 (Roundabout) at Chandigarh (km 0.000) to Kharar km 10.185) (length: 10.185 km) of NH 21 in the State of Punjab on EPC mode under NHDP Phase-V	Punjab			368.500	408.28	(10)
18	Rehabilitation and upgradation of existing road to 2-lane with paved shoulders configuration in Jowai–Meghalaya/Assam Border section of NH-44 from km 69.200 to km 173.200 in the State of Meghalaya	Meghalaya				526.90	(100)
19	Improvement and augmentation of Tirumayam–Manamadurai section of NH-226 from km 77.200 to km 154.929 (existing chainage from km 72.185 to km 149.800) (total design length 77.729 km) to 2 lanes with paved shoulders in the State of Tamil Nadu under NHDP-IV on EPC mode	Tamil Nadu			252.160	252.33	0

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SI No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
20	Improvement and augmentation of Aligarh Moradabad section of NH-93 to 2 lanes with paved shoulders from km 85.650 (existing chainage km 85.650) to km 232.020 (existing chainage km 232.000) in the State of Uttar Pradesh under NHDP Phase-IV on EPC mode	Uttar Pradesh				503.34	(100)
21	Improvement and augmentation of Chhapra-Rewa-Ghat-Muzaffarpur section of NH-102 to 2-lane with paved shoulders from km 1.300 (existing chainage km 1.300) to km 73.080 (existing chainage km 74.200) (total design total design length = 73.080 km) in the State of Bihar on EPC mode	Bihar			397.270	314.49	26
22	Improvement and augmentation of four laning from km 5.000 to km 79.340 (existing chainage) [design chainage km 5.000 to km 81.000] and two laning with paved shoulders from km 79.340 to km 118.795 (existing chainage) [design chainage km 81.000 to km 120.000] of Madurai-Ramanathapuram section of NH-49 total design length 115.000 km] in the State of Tamil Nadu under NHDP Phase-III on EPC mode	Tamil Nadu			1,134.350	734.55	54
23	Rehabilitation and upgradation to four laning divided carriageway with paved shoulders of Ludhiana-Talwandi Bhai section (existing chainage from km 85.980 to km 92.000) of NH-95 (length = 6.020 km) in the State of Punjab on EPC mode	Punjab			37.810	39.02	(3)
25	Widening and strengthening to two-lane with paved shoulder of Phalodi–Jaisalmer section of NH 15 from km 163.400 to km 323.857 in the State of Rajasthan under NHDP Phase-IV on EPC mode	Rajasthan			567.810	567.51	0

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Appendix 5 *continued*

SI No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
26	Improvement/augmentation of Thanjavur to Pudukottai section to 2-lane with paved shoulders from km 0.000 (existing chainage km 0.000) to km 55.228 (existing chainage km 56.460) (total design length = 55.228 km) of NH- 226 in the State of Tamil Nadu under NHDP Phase IV on EPC mode	Kerala	National Highways Authority of India		166.170	169.51	(2)
27	Improvement/augmentation of Tirumayam to Manamadurai section to 2-lane with paved shoulders from km 77.200 to km 154.929 (existing chainage km 149.800) (total design length = 77.729 km) of NH-226 in the State of Tamil Nadu under NHDP Phase IV on EPC mode	Kerala	National Highways Authority of India		252.160	252.53	0
28	Six Laning of km 192.00 to km 198.00 between Vadodara–Surat section of NH-8 including construction of a new four lane extra dosed bridge across river Narmada in the State of Gujarat on EPC mode	Gujarat	National Highways Authority of India		379.500	436.50	(13)
30	Jalandhar–Amritsar section of NH-1 from km 387.100 to km 407.100 in the State of Punjab to six lane (the "Project") through an EPC contract basis	Punjab	National Highways Authority of India		343.710	418.70	(18)
31	Rehabilitation and augmentation of the Jhalawar-Raj./MP border section of NH12 to two lane with paved shoulders through EPC contract	Rajasthan	National Highways Authority of India		227.360	181.890	25
32	Rehabilitation and augmentation of the Karauli–Dholpur section of NH-11B to two-lane with paved shoulders through EPC contract	Rajasthan	National Highways Authority of India		261.000	289.000	(10)
33	Rehabilitation and augmentation of the Bhilwara–Ladpura section of NH-758 to two-lane with paved shoulders through EPC contract	Rajasthan	National Highways Authority of India		259.750	240.100	8

continued on next page

Appendix 5 *continued*

Sl No.	Contract Name	Location	Authority	Contractor	Contract Value (in Rs. Cr)	RFP Cost (in INR Cr)	Tender Premium (%)
34	Rehabilitation and augmentation of the Gulabpura–Uniara section of NH-148D to two-lane with paved shoulders through EPC contract	Rajasthan	National Highways Authority of India		570.730	570.740	0
35	Rehabilitation and augmentation of the Ladnu (Nimbi Jodha)–Merta City section (PKG.I) of NH-458 to two-lane with paved shoulders through EPC contract	Rajasthan	National Highways Authority of India		538.85	368.150	46

( ) = negative; Co. = company; EPE = Eastern Peripheral Expressway; EPC = engineering, procurement, and construction; km = kilometer; Ltd. = limited; MORTH = Ministry of Road Transport and Highways; NH = national highway; NHDP-IV = National Highway Development Project-IV; NHIDCL = National Highways and Infrastructure Development Corporation, Limited; PIU = project implementation unit; RFP = request for proposal.
Note: Amount in Rs. Cr. Rupees 1 Crore = Rupees 10 million.
Source: National Highways Authority India.

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Hybrid Annuity Contracts for Road Projects in India

The hybrid annuity model is a popular type of public–private partnership that has been used in India for roads and is being attempted in other sectors. This paper examines whether hybrid annuity contracts provide value for money. It deconstructs and evaluates the costs of such contracts in India. It finds that the model in its current format does offer value for money and suggests ways of enhancing this.

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