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A Comparative Research on the Variations of PPP Contracts: Availability Payment PPP vs. Concession PPP*

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A Comparative Research on the Two Types of PPP Contracts: Availability Payment PPP vs. Concession PPP

ABSTRACT

It is fair to say that the research on Public Private Partnership (PPP), in particular, on its risk-return profiles, is rare, despite the fact that this form of infrastructure financing has been on the rise during the last two decades in a diverse set of countries. This study aims to fill that gap by offering a comparative study on the two frequently-employed PPP contracts in Korea and other countries - Availability Payment (AP) PPP contracts vs. Concession (C) PPP contracts - with respect to ex post (or realized during the operational stage) risk-adjusted return characteristics. To that end, we compiled an unique project-level data set that covers the performance indicators of those PPP projects initiated during 1995 to 2014 in Korea both at-contract as well as at-operation stages, and applied a three-factor CAPM model to estimate the alpha and beta for those two types of PPP contracts. Our empirical results indicate that: ceteris paribus, AP-PPP entails a higher market-driven risk to the private partners; the systematic risk factors caused by the size and by the book-to-market-ratio have statistically significant effects on the ex post returns; and, the ex post excess returns are shown to be not significant, neither statistically nor economically. Based on our findings, we discuss welfare implications of PPP contracts out of their systematic risk characteristics documented.

Keywords: PPP (Public Private Partnership), AP-PPP (BTO), C-PPP (BTL), three-factor CAPM

1 Introduction

Since the inception of PFI (Private Finance Initiative) in UK in 1992, the Public Private Partnership (PPP) has been widely used in various countries (e.g., Australia, France, Spain, Portugal, a number of Asian countries) as a new form of financing to build and operate different types of infrastructure. Korea is the country that has embraced the instrument early on, with the enabling legislation enacted in 1994[1] (henceforth, the Act) and, since then, over 700 infrastructure projects has so far been funded through the PPP contracts, covering a wide array of assets, e.g., roads, railways, ports, airports, water facilities, schools, military and public housing, museums, and so on. The first type of PPP contract utilized is Availability Payment (or AP-) PPP, which was originally introduced by the Act and was also referred to as Built-Transfer-Operate (BTO) deal. The private partner under the AP-PPP contract usually forms a Special Purpose Company (SPC), which is responsible for building a facility, transferring the ownership to the public entity (i.e., local or national government) upon completion, and operating the facility for a pre-fixed time period (e.g., 30 years) during which it recovers construction and operation costs and, hopefully, an appropriate net return to the investment by charging a user fee. The second contract type, which has been prevalent after the second amendment of the Act in 2005, is (or C) PPP, alternatively called as Built-Transfer-Lease (BTL) deal. The main difference between the two is the fact that, the first relies on the cashflow (or fee) generated by the facility built, the second receives a pre-determined periodic payment from the public partner to recover both construction and operation costs along with a risk premium that is determined ex ante (i.e., at the time of contract).

It is well-documented by various recent studies that the PPP-based infrastructure projects are more efficient than the traditional government-procured projects as they likely lower construction time as well as chance of cost overage (Monteriro (2005), Duffield (2008), Morallos and Amekudzi (2008), Graham (2011), Reznichenko (2012), Rajan, Gopinath and Behera (2013), Roy, Kalidindi and Soundararajan (2014), The World Bank (2014), Deslauriers (2015)). As to the risk-adjusted return profiles of the PPP contracts, the literature also examines different aspects of PPP contracts in different countries, such as: the cost of equity capital for AP-PPP in Korea by focusing on the financial information of SPCs (Shim (2006)); the excess returns to equity investment for healthcare PFI contracts in UK (Vecchi et al. (2013); the estimated optimal AP-PPP contracts in Korea at the time of deal (Shin (2009)); and, others to be noted - Bird et al., (2012), and Park et al. (2018). Despite these studies, it is fair to say that the existing literature is generally mute on actual (or post-contract) risk-return profiles of PPP contracts, e.g., whether the private partners earn appropriate levels of risk-adjusted returns, how those realized returns respond to different financial market conditions, and what attributes of the

[1] The initial act as the Promotion of Private Capital into Social Overhead Capital Investment Act of 1994, which was amended twice: first, changed to the Private Participation in Infrastructure (or PPI) Act of 1998, which allows project proposal by private entity; and, second, introduced C-PPP (or BTL) in addition to BT) and removed or limited Minimum Revenue Guarantee (MRG) by the government. Currently, further revision is being contemplated to accommodate the ICT and big data related public projects as well as to convert the list of allowable projects from a positive system to a negative one.

contract can be modified to make them more sustainable, and so on. This study aims to fill that gap by offering a comparative study on the two frequently-employed PPP contracts in Korea and other countries - Availability Payment (AP) PPP contracts vs. Concession (C) PPP contracts - with respect to ex post (or realized during the operational stage) risk-adjusted return characteristics. To that end, we compiled an unique project-level data set that covers the performance indicators of those PPP projects initiated during 1995 to 2014 in Korea both at-contract as well as at-operation stages, and applied a three-factor CAPM model to estimate the alpha and beta for those two types of PPP contracts.

Our preliminary results estimated based on the three-factor CAPM model employed indicate that: no excess return, neither to holding PPP projects as a whole nor to holding BTO projects, is shown; the beta for the market risk premium signals a counter-cyclical nature of PPP cash flows, for example, through a negative correlation between macroeconomic condition and cost indicator to PPP projects; the PPP cash flows are positively correlated with the spread for high Book-to-Market ratio (BTMR) stocks, possibly because such companies' shares are generally represent value stocks that share a similar clientele effect for cash-poor asset-rich consumer segments (i.e., retirees); and, PPP cash flows also show a positive correlation with the spread for small-size stocks, which may be caused by a higher of the BTL projects in our sample. Going forward, a further investigation is warranted to back the above findings. We will explore policy implications of our findings, as to how to change existing PPP contract regimes to be more welfare-enhancing in terms of ex ante projected contract rates as well as risk-sharing arrangements for both public counterparty (the first "P") as well as private partner (the second "P").

The remainder of the manuscript consists of the following six sections: institutional details of the two PPP contracts (section 2); literature review (section 3); data and variables compiled (section 4); empirical model and findings (section 5); policy implications and concluding remarks (section 6).

2 Institutional details: AP-PPP vs. C-PPP

As of EOY 2016, the on-going (or at-contract) PPP projects in Korea amount to 699 cases with the total investment of roughly 100 billion USD. Road and railroad construction represent the largest SOC segments funded by PPP, taking a 68.8% share, followed by education or environmental facilities (a 25.8% share). Between the two contract types, BTO or C-PPP contracts include 222 cases (31.8%) while BTL or AP-PPP contracts are 466 cases (66.7%), indicating that the former is being fewer in frequency but usually larger in funding size and it is vice versa for the latter. A predominant share of the cases are solicited by the government (570 cases or 81.5%), yet a meaningful share of the unsolicited (or private-sector-initiated) cases are used as well (129 cases or 18.5%).

Table 1. Types of PPP contracts in Korea (as of EOY 2016)

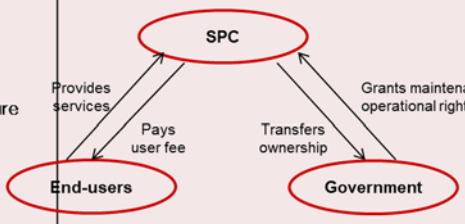
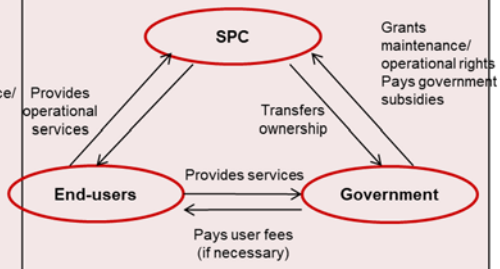
Classification		User Fee Type				Service Contract Type	Total
		BTO	BOO	BOT	Subtotal	BTL	
Number of Projects		222	7	4	233	466	699
	Composition %	31.80%	1.00%	0.60%	33.30%	66.70%	100.00%
Total Investment		731,552	11,906	6,580	750,038	352,045	1,102,083
	Composition %	66.40%	1.10%	0.60%	68.10%	31.90%	100.00%
Average Investment		86,163	10,204	6,580	102,947	14,335	61,920

Sector	Number of Projects		Total Investment		Average investement
	No. of Projects	Composition(%)	Amount	Composition(%)	
Solicited Proposal	570	81.50%	651,115	59.10%	1,142
Unsolicited Proposal	129	18.50%	450,968	40.90%	3,496
Total	699	100.00%	1,102,083	100.00%	1,577

As to the institutional characteristics of the two contract types, AP-PPP is generally for those services from which a clear revenue stream can be generated (e.g., toll roads, railroads, harbor facilities, and airports), whereas C-PPP is used for those that are more public good in nature without a clear user fee based cashflow (e.g., museums, schools, and military facilities). (See Table 2 for a comparison of the two contract types.) There are several hybrid contracts that differ in terms of the ownership (or timing thereof) and the operational right,[2] which can be viewed as derivatives out of the two main ones.

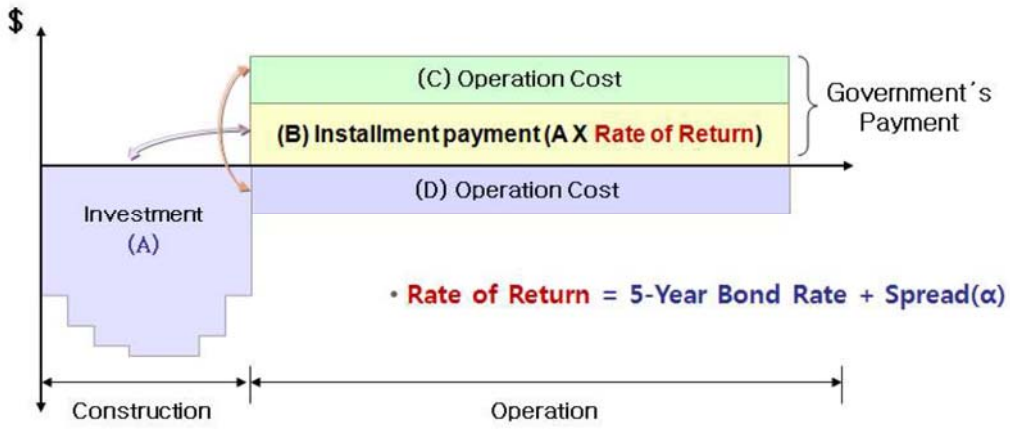
[2] They include BOT (Build-Operate-Transfer), BOO (Build-Own-Operate), BLT (Build-Lease-Transfer) along with other hybrid methods.

Table 2.

	BTO	BTL
Characteristics	Investment recovery is possible by imposing user fees on end-users	Investment recovery is difficult by imposing user fees on end-users
Examples	Roads, seaports, railways	Schools, sewage, military housing, cultural/welfare facilities
Investment Recovery	End-user fees	Lease payment by government
Project Risk	Risk on concessionaires	Risk-free on concessionaires
Return	Relatively high	Relatively low
Procurement schemes	BTO (Build-Transfer-Operate) BTO_rs(Build-Transfer-Operate-risk sharing) BTO_a(Build Transfer Operate-adjusted)	BTL (Build-Transfer-Lease)
Structure		

In terms of the risk-sharing arrangement, the main difference between the two contracts is which party (between SPC and the government) takes the market (or demand) risk in using the facility built: that is, under AP-PPP it is SPC who should bear the risk of deviating the realized demand (or actual user fee generated) from the projected one because its revenue is solely dependent upon the realized cashflow by operating the structure; and, under C-PPP it is the government who ends up taking the risk because she guarantees fixed payments to SPC for both building and operating the facility (the installed payment for construction, item B in the figure below, and the projected operational cost, item (D), matched with the government payment for that, item (C)). Nonetheless, the actual operational cost under C-PPP can differ from the projected level, which is labeled and assessed by Park (2015) and Park et al. (2018). In the case of AP-PPP, there is no scheduled government payment for operation (nothing for item (C)); Instead, realized user fee from operation replaces the item. Another key risk to be considered, for both types as a matter of fact, is the counterpary (or default) risk of SPC.

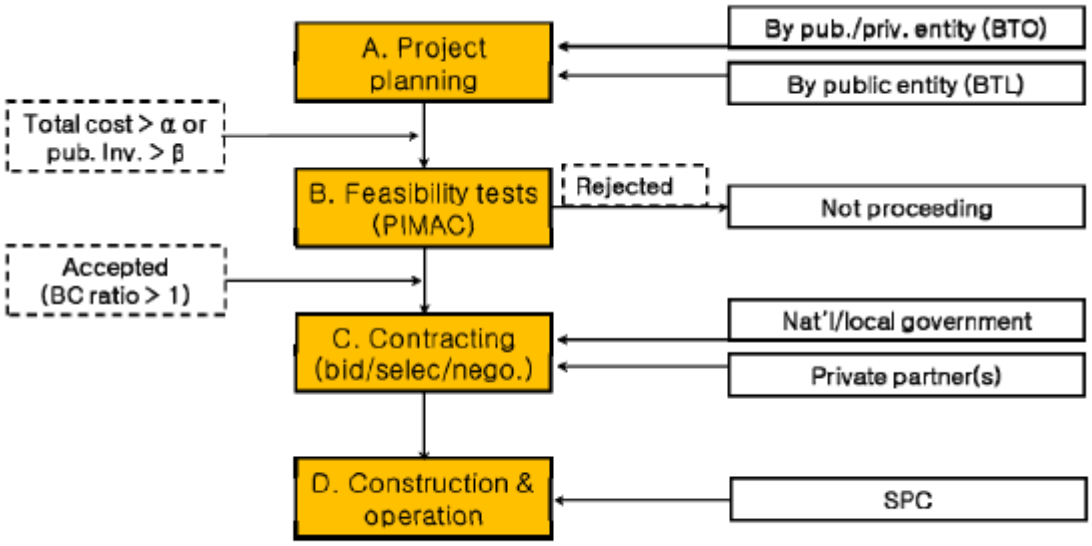
Figure 1. Cash flow of C-PPP contract



Source: Park (2015)

Typical PPP contacts take a long time span for both contracting as well as building and operation. For the former, in the case of AP-PPP, it takes 1~2 years for initial project planning (about 6 months for C--PPP) due to a heightened complexity involved with this type. In addition, both types have to go through a series of feasibility tests by the government (Ministry of Strategy and Finance, MOSF, along with the Private Investment Management and Assessment Center, PIMAC), which generally takes one to two years. After that, the contracting stage – selecting a private partner as primary negotiator, bargaining contract terms, and so on - can have more than one year, mainly due to the cost/budget saving effort on the part of the public partner. Once a deal is signed, then there are 3~5 years for construction and 20~30 years for operation. In terms of key stake holders, it is usually a builder (or construction company) for BTO (as a shareholder of SPC) along with financial investors and operating companies. There are other institutional details, such as insurance coverage for indemnity and damage that can occur during both construction and operation phases, taxes required (corporate income tax for SPC, value-added tax, among others), as well as conditions for early termination (caused either by SPC or by political reasons or natural disasters).

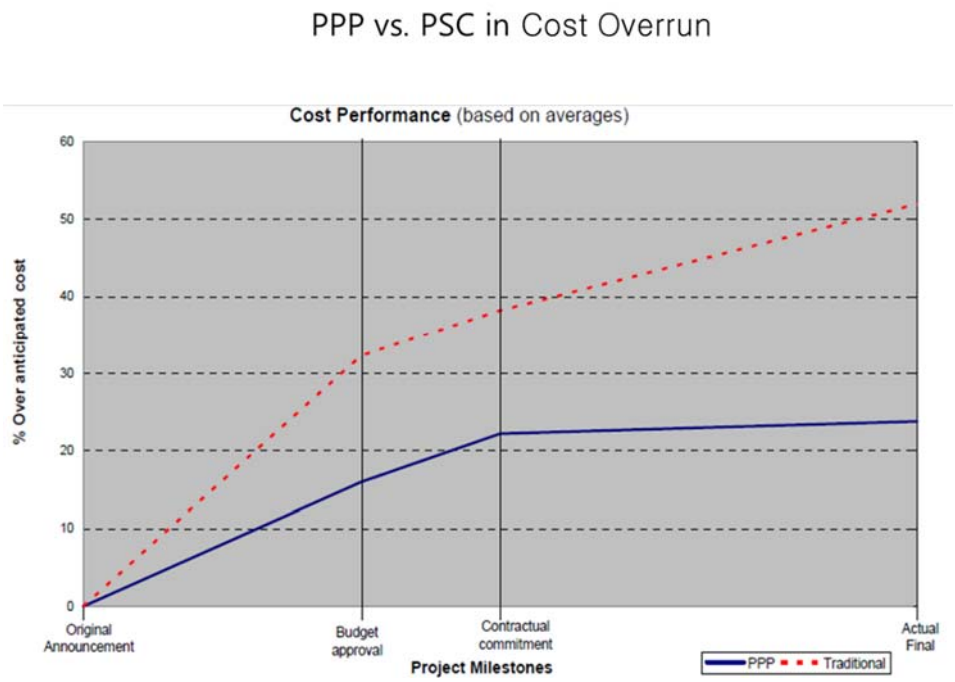
Figure 2. Key steps of the PPP procedure in Korea


A. Project planning
By pub./priv. entity (BTO)
By public entity (BTL)
Total cost > α or pub. Inv. > β
B. Feasibility tests (PIMAC)
Rejected
Not proceeding
Accepted (BC ratio > 1)
C. Contracting (bid/selec/nego.)
Nat'l/local government
Private partner(s)
D. Construction & operation
SPC

3 Literature review

As to the fiscal effect, PPP Projects are shown to lower construction time or cost overage in Australia and other countries, compared to the traditional government-procured Infrastructure projects (Duffield (2008), Rajan, Gopinath and Behera (2013), Reznichenko (2012), The World Bank (2014). In particular, the time and cost saving effects of PPP projects, generally measured by Value for Money (VFM) formulae, in Canada (Deslauriers (2015)), in Portugal (Monteriro (2005)), in Korea (Bae (2015)), in India (Roy, Kalidindi and Soundararajan (2014)), as well as other countries (EPEC (European PPP Expertise Centre) (2011), Morallos and Amekudzi (2008), Graham (2011)). As to the success factors of PPP projects, the literature identifies a proper output specification (Javed, Lam and Zou (2002)), along with cost efficiency, trust (among contract counterparties), level of communication, and appropriate risk-sharing arrangement (Doloi (2012), and Shen, Platten and Deng (2006)).

Figure 3. Comparison of cost overrun probability



Source: Duffield (2008)

As to the nature of financial risk, Park and Cho (2018) provide a theoretical framework to examine C-PPP's risk premium incorporating construction risk, operation risk, and term premium. Using 426 AP-PPP projects in Korea, the study finds that construction risk has the biggest and robust impact on the risk premium. The education and cultural asset groups show systematically higher risk premium than

base group (environment asset). The test also supports investor's behavior of risk averseness because the correlation coefficient of investment size is negative. Several policy implications are suggested: A procuring government should be prudent to select capable private partner enough to be able to manage allocated risk. It is desirable to prepare a meticulous development plan to reduce construction risk; Shortening planning period may promote PPP without increasing required risk premium.

On the other hand, ROBERT J, et, al. (2014) studied whether asset pricing models can predict the future returns of publicly-listed PPPs in Australia. They found that asset pricing models (both CAPM and Fama-French models) exhibit poor out-of-sample predictive performance when compared to simple, fixed excess return models for the period 1997 through 2012. They also suggest the long-term historical mean return to be a reasonable starting point for superannuation funds seeking to understand the long-term expected returns of publicly-listed infrastructure and PPPs. In terms of the systematic risk, Rothballer and Kaserer (2012) argue that the reason for the low systematic risk is due to the lower levels of market competition in infrastructure based industries, due to the high levels of fixed capital investment required.

Several other studies examine the nature of financial risk of PPP projects. In particular, Bird, Liem and Thorp (2012) measured a proper level of infrastructure investment return, using Fama-French three factor model. The study used UBS infrastructure index, which include 200 infrastructure stocks with mixture of 40% US stocks and 40% European stocks, and remaining 20% from Asia. They revealed that infrastructure indices exhibit excess returns with low levels of systematic risks. Vecchi V et al. (2013) seek to judge whether excess equity returns exist, using the 77 samples of healthcare PFI contracts from 1997 to 2011 in UK. The study measured Weighted Average Cost of Capital (WACC) of sponsors against project equity IRR. The average of realized excess equity return over the estimated WACC is 9.27%. Gray et al.,(2010) maintained that, in the context of PPPs, the standard framework produces a paradox whereby government appears to be made better off by taking on more systematic risk. However, they also showed that there is no problem with CAPM theory, but rather is caused by its misapplication in practice: the systematic risk of cash flows is frequently mis-estimated, and the correction of this error solves the apparent paradox. Shin (2009) assumed that the investment return of BTO is comprised of liquidity premium, construction risk premium, operation risk premium, and demand forecast risk premium. The study also considered option values of termination clause both by government and private investor to estimate the optimal level of investor's return. The estimated range of optimal BTO return is from 6.61% to 8.33%. Shim, et al. (2006) researched cost of equity capital for BTO based on the financial information of special purpose company (SPC), using CAPM. This study is one of the earliest pioneers that tried to estimate cost of capital for PPP project in Korea.

4 Data and variables (data sources, variables compiled, summary statistics)

Financial data for BTL and BTO projects have been retrieved from statistics tool called ‘TS 2000’. TS 2000 features company’s financial data, stock and management information on companies listed on the Korea Stock Exchange, companies registered on KOSDAQ, and independent audit provided by Korea Listed Companies Association. This data has been utilized as ‘post-contract data’ or ‘realized amount’ for AP-PPP and C-PPP. Concession data for the BTL and BTO projects have been retrieved from the original contracts between SPCs and line ministries, which has been audited by relevant accountants. Concession data has been utilized as ‘ante-contract’ data or ‘projected amount’ for AP PPP and C PPP.

About AP-PPP (or BTL), PPP projected covers 398 projects, consists of 216 education, 56 national defense, 31 culture and tourism, 10 welfare, 4 information and communication, 80 environment, and 1 railway. Of these, 350 projects were implemented, so we obtained financial data for each Special Purpose Company on the TS2000. The data we evicted are a statement of financial position, income statement and statement of cash flow. See Tables 3 and 4, and Appendix 1 for the summary statistics that are separately compiled for BTL and BTO.

- Project-level DB compiled: 332 C-PPP & 120 AP-PPP cases, from 1998 to 2018
- Key project=level variables included:
- Total project cost (mean, minimum, maximum, & STD), by PPP type
    - Project duration, for construction & for operation
    - Projected & ex post yields (plus benchmarking interest rates)
    - Maximum leverage ratios for SPC, projected and realized
    - Insurance contracts and tax requirements (at contract)
    - Minimum capital ratios, one for construction and another for operation
    - Projected vs. realized revenues (for C-PPP)
    - Projected vs. realized operational costs (for AP-PPP)

Table 3. AP-PPP : Average Project Period

Sector	Construction (month)	Operation (month)
Education	14	234
National defense	23	242
Culture and Tourism	21	247
Welfare	18	240
Information and Communication	10	114
Environment	38	240
Railway	53	240
Total	25	222

Table 4. C-PPP: Average Project Period

Sector	Construction (month)	Operation (month)
Road	23	195
Culture and Tourism	16	113
Distribution	31	257
Railway	18	117
Port	48	451
Environment	18	131
Total	26	211

In term of the key indicators of financial performance at contract (Tables 5), AP-PPP (BTO) projects show higher ex ante yields compared to C-PPP (BTL): on the average, 2.87% ROA for BTL vs. 4.68% for BTO; 3.55% ROC for BTL vs. 14.01% for BTO. The operating margin, on the other hand, is higher for BTL (0.79%) compared to BTO (-2.47%), while the financial leverage is higher for BTL (80%) than BTO (62%).

Table 5. Comparison of financial indicators

Performance Comparison: BTL vs. BTO

Performance Measures	BTL	BTO	H_0: *Equal Performance*
ROA	0.0287	0.0468	
	(18.2783)	(5.9089)	-2.2498*
ROC	0.0355	0.1401	
	(5.3563)	(1.6598)	-1.2351
$CF_{operation}$ /*Asset*	0.0218	0.0416	
	(7.1562)	(5.2121)	-2.3209*
Operating Margin	0.7945	-2.4862	
	(11.1097)	(0.8033)	1.0597
ROE	-0.0736	-16.2579	
	(-6.4143)	(1.0233)	1.0187
Free CF/Assets	0.0373	-0.0282	
	(4.8113)	(1.4245)	3.0846*

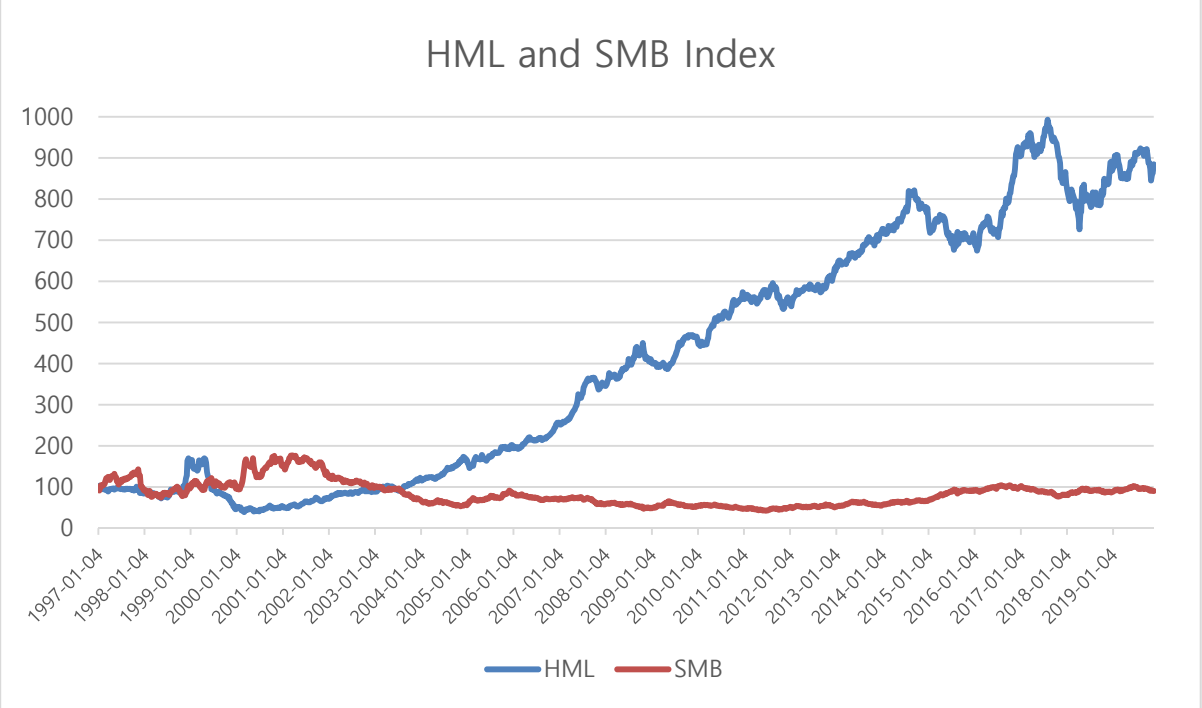
Performance Comparison: BTL vs. BTO

Performance Measures	BTL	BTO	H_0: *Equal Performance*
Financial Leverage	0.8038	0.6204	
	(143.607)	(13.5474)	3.9770*
Operating Leverage	0.0138	0.0563	
	(9.5713)	(5.1860)	-3.8788*
Asset Turnover	0.0737	0.3646	
	(12.9011)	(4.9020)	-3.8997*

Two main variables to implement the three-factor CAPM are HML, which stands for "High Minus Low" in terms of the book-to-market ratio and shows excess return of value stock over growth stock, and SMB, which represents "Small Minus Big" in terms of market capitalization and measures the historic excess returns of small cap over big cap stocks. We retrieved the local HML and SMB market index

from "FnIndex[3]". The index period is from 1997 January to 1999 November and the frequency is weekly basis. The SMB is calculated by weighted average of small minus big stocks, which are categorized based on median market cap. The HML index is calculated using the difference of High and Low book-to-market stocks among the three categories of high, medium, and low book-to-market ratio stocks.

Figure 4. Trend of HML and SMB indices



Source: FnIndex

[3] http://beta.fnguide.com/SNI/SNI_FactorModelDetail.asp?u_cd=3FM.2B3.X

5 Empirical model and findings

The underlying empirical model used in this study is the Fama-French 3-factor CAPM, which measures the sensitivities of a particular asset return to changes in three systematic (or market-wide) risk drivers – market risk premium (spread of the return to market portfolio over risk-free rate), book-to-market ratio, BTMR, premium (spread between returns to assets with high BTMR minus to those with low values), and size risk premium (spread between returns to those with small asset bases minus to those with small ones). Given that the firms in our database, SPCs, are mostly non-listed firms, we follow the estimation framework suggested by Driessen, Lin and Phalippou, DLP (2012). In particular, DLP (2012) introduces a methodology to estimate abnormal performance and risk exposure of nontraded assets' cash flows (hedge funds & Private Equity Funds) based on the financial indicators of the firms in question.

The estimation framework relies on the NPV of each PPP project (equation (1)), which includes both cash outlays ($-CF_0$) as well as discounted cash flows with a time-varying discount rate (IRR). The numerator, CF, in equation (1) is Net Operational Income (NOI) computed based on the financial data for each project for each calendar year, while the discount rate in equation (2), the time-varying IRR, is specified as a three-factor CAPM:

$$NPV = -CF_0 + \sum_{t=1}^{T} \frac{CF_t}{\prod_{\tau=1}^{t}(1 + IRR_\tau)} \quad (1)$$

$$IRR_t = r_{f,t} + \alpha_1 + \alpha_{BTO} \times 1_{BTO} + \beta_{mkt} \times r_{mkt,t} + \beta_{hml} \times r_{hml,t} + \beta_{smb} \times r_{smb,t} \quad (2)$$

where:

$r_{f,t}$ ~ risk-free rate (the monetary stabilization bond rate);

$r_{mkt,t}$ ~ Market risk premium (stock market return - $r_{f,t}$);

$r_{hml,t}$ ~ Book-to-market risk premium (top companies′ average return in terms of Book Value/Market Value minus bottom companies′ average return);

$r_{smb,t}$ ~ Small-to-large firms′ risk premium (top companies′ average return in terms of size of asset

base minus bottom companies′ average return); and,

α, β ~ parameters to estimate.

This approach allows us to measure the PPP-unique alpha (excess return, ER, to PPP cash flows), the contract unique alpha (ER to AP-PPP or BTO contracts), along with the three sensitivity parameters (or betas) to the systematic risk factors. The least square optimization problem is to search the parameter vector, $\theta = [\alpha_1 \ \alpha_{BTO} \ \beta_{mkt} \ \beta_{hml} \ \beta_{smb}]'$, that minimizes the following expectation operator:

$$E\left[NPV \times \frac{\partial NPV}{\partial \boldsymbol{\theta}}\bigg|_{\boldsymbol{\theta}=\boldsymbol{\theta_0}}\right] = \mathbf{0} \quad (3)$$

.

Given the highly nonlinear nature of the estimation model, GMM turns out to be the proper estimation method, whereas the standard error for each parameter is computed through the second moment estimation. The preliminary results of the parameter estimation are shown in the table below.

Table 6. Empirical results, & preliminary findings

Variable	Estimated Coefficien	t-statistics
PPP Alpha	-0.0003	-0.0002
BTO Alpha	0.0234	0.0130
Market Beta	-1.1781	-48.3757
HML Beta	2.0050	16.9056
SMB Beta	0.8353	7.1665

The results show that the two intercept terms, α_1, α_{BTO}, are not statistically significant, indicating no excess return neither to holding PPP projects nor to BTO projects. Interestingly, the beta for the market risk premium, $r_{mkt,t}$, is negative and highly significant, which may be viewed as unconventional in a one-factor CAPM but should be interpreted differently under the three-factor model estimated. The negative parameter may signal a counter-cyclical nature of PPP cash flows: for example, in an ebullient time, general price level (e.g., CPI) tends to rises, and vice versa, which leads to a counter-cyclical cost generation for PPP contracts, both BTO and BTL projects. A further digging on this possibility is

warranted. The outcome for the second beta, for $r_{hml,t}$, is positive and statistically significant and the magnitude of the parameter is over two, implying that the PPP cash flows are positively correlated with the spread for high BTMR stocks and that one unit change in the spread leads to two units change in the PPP cash flows. Given the likelihood that the high-BTMR companies' shares represent value stocks (e.g., REITs), PPP cash flows may have a similar clientele effect for cash-poor asset-rich consumer segments (i.e., retirees). The third beta, for $r_{smb,t}$, is also positive and statistically significant with the magnitude of roughly one, indicating that PPP cash flows have a positive correlation with the spread for small-size stocks. We conjecture this outcome to be caused the high representation of the BTL projects, which are generally small in size.

6 Policy implications and concluding remarks

In this study, we aim to shed light on the ex post (or realized) cash flow characteristics of PPP projects by using an unique project-level data set covering the time-varying performance indicators of those cases initiated during 1995 to 2018 in Korea. The estimation results based on the three-factor CAPM model indicate that: no excess return, neither to holding PPP projects as a whole nor to holding BTO projects are shown; the beta for the market risk premium signals a counter-cyclical nature of PPP cash flows, for example, through a negative correlation between macroeconomic condition and cost indicator to PPP projects; the PPP cash flows are positively correlated with the spread for high BTMR stocks, possibly because of the high-BTMR companies are viewed as value stocks that share a similar clientele effect for cash-poor asset-rich consumer segments (i.e., retirees); and, PPP cash flows also show a positive correlation with the spread for small-size stocks, which may be caused by a higher of the BTL projects in our sample. Going forward, a further investigation is warranted to back the above findings, which should be viewed as preliminary.

The ultimate goal of our endeavor is to document policy implications of our findings as to how to change existing PPP contract regimes to properly reflect the empirical evidences obtained from this study. That is, the questions like how existing PPP contracts in terms of setting the ex ante project yields can be modified to better reflect the ex post cash characteristics, or their correlations with the market-driven risk drivers, and how welfare-enhancing contract rates as well as risk-sharing arrangements can be instituted for both public counterparty (the first "P") as well as private partner (the second "P") are the ones that should be further clarified.

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Appendix 1.

A.1. AP-PPP Projected : Summary Statistics

Sector	Classification	Mean	St.d	min	max	10th pctl	90th pctl
Education	Ratio of sales to cost	2.08	1.74	0.00	4.03	0.00	3.99
	Ratio of operating profit to cost	1.14	1.01	-0.07	2.52	-0.01	2.45
	Ratio of operating profit to sales	40.89	26.20	0.00	84.26	0.00	69.44
	Ratio of net profit to sales	-0.05	0.28	-1.72	0.05	-0.01	0.00
National defense	Ratio of sales to cost	2.40	2.10	0.00	4.59	0.00	4.58
	Ratio of operating profit to cost	1.49	1.54	-1.15	3.90	-0.02	3.29
	Ratio of operating profit to sales	20.58	154.85	-885.91	100.00	0.00	96.52
	Ratio of net profit to sales	-0.35	2.00	-12.50	0.00	-0.02	0.00
Culture and Tourism	Ratio of sales to cost	2.58	2.26	0.00	5.05	0.00	4.99
	Ratio of operating profit to cost	0.88	0.85	-0.48	2.16	-0.01	1.87
	Ratio of operating profit to sales	9.57	81.59	-447.97	85.41	0.00	50.75
	Ratio of net profit to sales	-0.03	0.17	-1.03	0.01	-0.01	0.00
Welfare	Ratio of sales to cost	1.90	1.62	0.00	3.83	0.00	3.73
	Ratio of operating profit to cost	0.74	0.73	-0.25	2.02	0.00	1.79
	Ratio of operating profit to sales	25.34	29.34	-62.74	100.00	0.00	52.90
	Ratio of net profit to sales	-0.01	0.05	-0.32	0.03	-0.02	0.00
Information and Communication	Ratio of sales to cost	2.54	4.01	0.00	9.79	0.00	9.67
	Ratio of operating profit to cost	1.18	1.82	0.00	4.37	0.00	4.31
	Ratio of operating profit to sales	17.61	24.66	0.00	97.10	0.00	46.18
	Ratio of net profit to sales	0.02	0.11	0.00	0.70	0.00	0.00
Environment	Ratio of sales to cost	-0.02	0.09	-0.32	0.05	-0.02	0.03
	Ratio of operating profit to cost	3.88	3.80	0.00	9.79	0.00	9.59
	Ratio of operating profit to sales	1.44	1.67	-0.33	4.37	0.00	4.25
	Ratio of net profit to sales	22.28	28.20	-6.03	97.10	0.00	47.52
Railway	Ratio of sales to cost	0.45	0.49	0.00	1.30	0.00	1.17
	Ratio of operating profit to cost	0.12	0.42	-0.78	0.98	-0.37	0.76
	Ratio of operating profit to sales	4.86	54.24	-143.91	100.00	-72.96	71.35
	Ratio of net profit to sales	0.02	0.07	-0.01	0.32	-0.01	0.05

A.2. AP-PPP Realized: Summary Statistics

Sector	Classification	Mean	St.d	min	max	10th pctl	90th pctl
Education	Ratio of sales to cost	1.29	1.94	0.00	5.06	0.00	4.46
	Ratio of operating profit to cost	0.48	0.79	0.00	2.31	0.00	1.89
	Ratio of operating profit to sales	11.39	17.98	0.00	48.25	0.00	40.60
	Ratio of net profit to sales	0.00	0.00	0.00	0.00	0.00	0.00
National defense	Ratio of sales to cost	1.78	2.81	0.00	12.07	0.00	5.49
	Ratio of operating profit to cost	0.32	1.17	-3.91	3.07	0.00	2.20
	Ratio of operating profit to sales	6.88	22.41	-72.56	53.33	0.00	46.33
	Ratio of net profit to sales	0.00	0.02	-0.13	0.01	0.00	0.01
Culture and Tourism	Ratio of sales to cost	1.28	2.33	0.00	6.38	0.00	5.66
	Ratio of operating profit to cost	0.56	1.04	-0.14	2.99	0.00	2.58
	Ratio of operating profit to sales	6.93	32.49	-155.01	47.83	0.00	45.10
	Ratio of net profit to sales	0.00	0.02	-0.14	0.00	0.00	0.00
Welfare	Ratio of sales to cost	1.00	2.01	0.00	6.15	0.00	5.06
	Ratio of operating profit to cost	0.64	1.30	0.00	4.26	0.00	2.87
	Ratio of operating profit to sales	15.47	27.97	0.00	72.32	0.00	67.69
	Ratio of net profit to sales	0.00	0.00	0.00	0.00	0.00	0.00
Information and Communication	Ratio of sales to cost	1.48	2.89	0.00	8.80	0.00	7.36
	Ratio of operating profit to cost	0.30	0.86	-0.33	3.74	0.00	1.07
	Ratio of operating profit to sales	4.76	12.13	-6.03	47.66	0.00	23.25
	Ratio of net profit to sales	0.00	0.01	-0.02	0.00	-0.01	0.00
Environment	Ratio of sales to cost	42.30	50.96	0.00	143.92	0.00	118.70
	Ratio of operating profit to cost	2.19	2.91	-1.48	9.06	0.00	6.59
	Ratio of operating profit to sales	2.82	3.06	-1.48	8.54	0.00	6.94
	Ratio of net profit to sales	0.00	0.01	0.00	0.02	0.00	0.01
Railway	Ratio of sales to cost	0.26	0.61	0.00	1.82	0.00	1.58
	Ratio of operating profit to cost	0.22	0.53	-0.05	1.65	-0.04	1.35
	Ratio of operating profit to sales	13.40	31.19	0.00	90.83	0.00	86.95
	Ratio of net profit to sales	0.00	0.00	-0.01	0.00	-0.01	0.00

A.3. C-PPP Summary Statistics

Sector	Classification	Mean	St.d	min	max	10th pctl	90th pctl
Education	Mark-up	1.14	0.19	0.08	1.7	1	1.43
	Ratio of expenses to revenues	6.11	0.64	3.61	7.68	5.51	6.88
	Interest rate for construction loan	6.83	1.07	3.26	10.51	5.72	8.11
	Total Private Investment	42,700	33,028	1,797	401,813	21,654	60,156
	Facility rent	74,983	57,457	2,569	690,197	34,835	106,949
	Operating cost	22,415	26,240	564	289,048	5,301	34,749
National defense	Mark-up	1.13	0.15	0.49	1.29	1.04	1.29
	Ratio of expenses to revenues	6.06	0.56	4.55	8.48	5.68	6.92
	Interest rate for construction loan	7.32	0.92	5.74	9.97	6.12	8.5
	Total Private Investment	69,951	29,526	17,649	157,251	34,371	106,520
	Facility rent	121,106	53,038	26,800	279,000	58,761	184,513
	Operating cost	22,510	8,983	7,563	44,396	11,440	34,604
Culture and Tourism	Mark-up	1.21	0.15	0.86	1.6	1.04	1.4
	Ratio of expenses to revenues	6.09	0.56	4.66	7.05	5.35	6.63
	Interest rate for construction loan	7.17	1.01	5.96	10.26	6.06	8.08
	Total Private Investment	30,175	21,932	10,731	101,907	11,593	61,993
	Facility rent	55,238	41,597	2,145	183,889	22,428	112,810
	Operating cost	26,019	23,347	2,099	126,532	11,750	49,636
Welfare	Mark-up	1.57	0.54	1.17	3	1.19	1.79
	Ratio of expenses to revenues	6.31	0.73	5.23	7.17	5.28	7.13
	Interest rate for construction loan	7.43	1.31	5.9	9.63	6.18	9.29
	Total Private Investment	27,327	19,959	3,976	56,412	5,547	51,280
	Facility rent	42,571	37,513	7,409	115,340	13,011	86,668
	Operating cost	11,931	5,758	5,702	21,467	5,771	19,801
Information and Communication	Mark-up	1.16	0.42	0.7	1.68	0.79	1.56
	Ratio of expenses to revenues	5.55	0.82	4.78	6.3	4.81	6.27
	Interest rate for construction loan	7.53	1.41	5.8	9.25	6.31	8.74
	Total Private Investment	51820	77548	8075	197984	9622	122986
	Facility rent	72710	114966	9832	245062	12269	176940
	Operating cost	23431	32782	5281	72534	5632	53611
Environment	Mark-up	1.01	0.17	0.5	1.38	0.82	1.18
	Ratio of expenses to revenues	5.69	0.58	4.29	6.81	4.89	6.4
	Interest rate for construction loan	6.83	0.97	5	11.5	5.68	7.76
	Total Private Investment	71,615	33,429	21,563	150,020	32,749	114,913
	Facility rent	121,723	58,836	35,309	286,178	53,683	194,798
	Operating cost	21,467	12,828	5,348	75,804	9,310	35,594
Railway	Mark-up	0.73	0.04	0.7	0.76	0.71	0.75
	Ratio of expenses to revenues	5.7	0.04	5.67	5.73	5.68	5.72
	Interest rate for construction loan	6.07	0.18	5.94	6.19	5.97	6.17
	Total Private Investment	502,186	89,390	438,978	565,394	451,620	552,752
	Facility rent	836,464	146,164	733,110	939,817	753,781	919,146
	Operating cost	60,661	18,316	47,709	73,612	50,299	71,022

Appendix 2. Assessment and Performance Monitoring System of PPP contract