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Mechanism for Market Valuation of State-Owned Enterprises without Privatization

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Abstract [*]

State-owned enterprises (SOEs), including state-owned banks, can be both systemically and politically important for many economies. While many of these firms have been privatized in recent decades, for various political or practical reasons many are likely to remain 100 percent state-owned, which prevents them from obtaining a market-based valuation. Having a market signal for the value of SOEs could be desirable because it could help: (i) inform the treasury of the net present value (NPV) of expected cash flows; (ii) impose some discipline on management; (iii) signal changes in capture by entrenched groups; and (iv) value discoveries and R&D that are slow to show up in cash flows. This paper presents a novel mechanism to create a market value for SOEs that cannot have publicly traded equity. It is based on the idea that parties, potentially independent from the SOE, can trade contingent financial claims for the future cash flows that an SOE pays to the government. Technically, it is a set of Arrow-Debreu securities that can mimic the SOE's cash flows. The document discusses various ways to implement this principle, as well as the potential challenges and some answers to these challenges. Preliminary calculations show that issuing claims equivalent to 5 to 10 percent of salient Latin American SOEs could be sizeable to get analyst coverage and liquidity, *without* compromising state ownership of assets and decisions.

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1. Market Value for State-Owned Enterprises

In most countries, state-owned enterprises (SOEs) tend to account for a smaller share of GDP than was the case 30 years ago. Although governments around the world have embarked on massive privatization programs, many governments still keep some SOEs under 100 percent state ownership for a variety of political and strategic reasons (see Bortolotti and Faccio, 2009; Lazzarini and Musacchio, 2014; Megginson and Netter, 2001). One limitation of that situation is that these SOEs have no current market valuation. Of course, there are various other tools in the toolbox for improving SOEs management and performance (e.g., IDB-FMM, 2014), but so far the absence of a market valuation seems to be an important downside of keeping them 0 percent private. Market prices for a company provide information that could be useful to managers, owners, or stakeholders. We assume that the market valuation can provide an external and potentially disciplining assessment for the company. We assume the non-market valuations produced by the company's staff or by external consultants are very imperfect substitutes of market valuations, for example because of agency problems,[1] behavioral biases, or other failures.

This paper presents a new mechanism to create a market value for SOEs that cannot have publicly traded equity because of political or administrative restrictions. The innovation is based on the idea that parties, potentially independent from the SOE, can trade contingent financial claims for the future cash flows that the SOE pays to the government. Technically this is a well-known idea, applied in many settings and labeled as Arrow-Debreu state-contingent securities. The innovation is to create one synthetic asset that can mimic the SOE's residual cash flows. Unlike privatization, which gives up both residual cash flow rights and residual control rights to equity holders, this pseudo-equity instrument would only give exposure to the cash flows, without giving up any control or voting rights.

To be clear, this paper does not take any stand on whether it would be optimal to privatize an SOE.[2] In our work we are simply saying that in some settings there is a practical restriction to privatization (which might be either technically or politically valid), but that this restriction does not immediately imply that one cannot have a market based valuation for the SOE. There is a space for instruments that could plausibly be politically tolerated because they

[1] For example, the so called "soft budget constraint" (Kornai et al., 1986; 2000; Lin and Tan, 1999; Maskin, 1999); other political motivations (Carvalho, 2014; Micco et al., 2007); or various aspects of market valuation (Boubakri and co-authors 2005, 2009, 2010, 2011, and 2014; Ben-Nask et al., 2012). Borisova and Megginson (2011); Borisova et al. (2012; 2013); Jones et al. (1999); and Megginson (2005) explore various aspects of governance and valuation in SOEs.

[2] In contrast to other papers that aim to provide evidence of benefits from privatization, such as La Porta and Loez de Silanes (1999), or papers showing some of the costs, such as Haber (2005).

do not give up government assets and control, but that still have values coming from people putting their wallets where their mouth is.

As a practical example, the Constitutions of Panama and Chile argue that the assets of flagship SOEs like the Panama Canal or CODELCO are government owned. But at the same time there seems to be no specific constitutional restriction on the uses of some of the cash-flows generated by these assets. This is a crucial difference that could enable the mechanism proposed in the paper to be implemented.

Before moving forward, it is worth emphasizing that the mechanism proposed in this paper is not for any SOE. In fact, for this alternative market-based mechanism to work, there are some prerequisites. The company should be large enough, implying that a relatively small share of the firm floating in a synthetic security can attract enough investors and analysts; otherwise, the market-based valuation would not be very interesting as an estimation of the future stream of cash flows. Additionally, the firm should ideally be profit-oriented, as opposed to having a purely social goal. Otherwise potential investors in the synthetic securities would fear that the government could tunnel profits out of the company in the form of unrecorded cross-subsidies. Firms such as CODELCO, Panama Canal, or the upstream portions of PEMEX are the types of canonical "for-profit" SOEs we have in mind to explore these types of innovations. These and other points will be developed in the remainder of the paper.

1.1. The Need for Market Values for SOEs

In theory, prices represent the forward-looking discounted value of the future stream of after-tax profits to be received from owning a company. Share prices tend to rise when circumstances or decisions improve. Thus, they could provide valuable feedback for decisions about the company. Having a market price can also be a problem if managers overreact to them, as argued by Albagli, Helwig, and Tsyvinski (2011), but on net there seem to be lost opportunities when owners cannot observe the market's expectation about the company's value. For SOEs that are 0 percent privatized, it would be useful to have a market valuation that could benefit at least the following players:

1. The national treasury, which owns the SOE. It could get an additional estimate of expected future cash flows, which is useful in general but even more so for countries that have modern fiscal rules (see Frankel, 2011). A figure that originates from multiple buyers and sellers making bets on the value of the SOE is potentially a useful and disciplined figure to use in calculating a portion of the future fiscal revenues. In

particular, countries in which SOEs are a large source of fiscal revenues would naturally benefit from having a market valuation of the net stream of income they should expect to receive. For example, Panama's fiscal planning would greatly benefit from having as an anchor the market valuation of the future flows coming from the Panama Canal Authority, Panama's main SOE, which operates the Panama Canal.

2. The SOE's management and owners would like to have a market valuation, to be able to monitor market reactions to their actions. For example, a sequence of poor decisions could be reflected in a lower stock price, and that market reaction could make managers accountable, or induce them to react and correct some decisions. Today, there is no such feedback coming from a market valuation of SOEs. For example, various firms may have various forms of increasing current profits at the expense of long-run value (e.g., under- investing in maintenance of the Panama Canal, under-investing in exploration in mining firms like CODELCO), which could amplify the so-called fiscal extraction problem.

3. Citizens may want to reduce the potential capture of SOEs by unions and entrenched groups. In this scenario, monitoring the market value of the company could be a useful disciplining device. For example, massive strikes of SOE employees could impact the value of the company. News about the value lost could make the SOE more accountable to the public. Also, massive declines in value after a large non-competitive bidding for procurement could be interpreted as a market signal that the deal was not made at market prices and there may be potential siphoning of profits from the company. We separate this attribute from No. 2 above because of the widely dispersed nature of shareholding in SOEs.

4. A market price may improve the valuation of research and development (R&D) projects and exploration. These are activities that do not generate immediate cash flow. This means that the only estimate of the return on these investments is the expectation that some people in the SOE may have about future cash flows. A market price may help to discipline these estimates and contrast them to what the market thinks the innovations are worth, for example by looking at market prices before and after the announcement of these innovations. There are reasonable grounds for a shareholder to be cautious about the projections made by internal experts. Burton, Lonie, and Power (1999) show that after the announcement of a new investment project, the change in the stock market

valuation does not necessarily reflect the additional valuation suggested by the firm. Ferguson and Scott (2011) show how presentations to boutique resource investors in Australia generate an abnormal return in the market valuation of these firms. In the long run, however, they are unable to see that this effect persists. Titman, Wei, and Xie (2004) show that firms that have large investment expenditures tend later to underperform. All these concerns about projections made by firms naturally suggest that ministers of finance and citizens should be pragmatic but vigilant about the actual value of the new discoveries. Having an independent market valuation could be a step forward in that process, although not a perfect one.

In short, having a market price for the company could potentially improve agency problems in the management of these organizations. It can harden the soft budget constraint that some of their decisions face (e.g., Kornai, 1986). In addition, having a market-based valuation could improve the quantification of contingent liabilities of some of these firms (e.g., provisions for retirement plans, mine closure costs, etc.)

Clearly a market valuation is neither necessary nor sufficient to overcome this information problem, but it can be helpful. Evidence from Petrobras in Brazil suggests that it is not sufficient to have a market price. SOEs should also consider other measures for valuation that are currently in the toolbox recommended by international organizations (e.g., IDB-FMM, 2015; World Bank, 2014).

1.2. What Solutions Are Available Today? Why Are They Insufficient?

Today's SOEs do not operate in total darkness. The current toolbox suggests various measures to improve the management of SOEs (World Bank, 2014). SOEs can, for example, use current ratios of efficiency to evaluate their performance. SOE staff can also perform project evaluation. On a different front, they can improve their corporate governance to facilitate feedback into the company. The SOE can also bring third-party consultants or experts that value the company according to some criteria and to provide various types of benchmarking. What has been more controversial in this current toolbox is that some SOEs could be partially or totally privatized, as a way to get a market valuation and to arguably catalyze some changes. As mentioned at the beginning, in this paper we do not take any stand on whether it is optimal or not to privatize, but we argue that practical and political considerations sometimes prevent this alternative. If this is the case, then the current toolbox does not produce a true market value of the SOE, generated by people who risk their own money to value the company. We do not want to claim that this

restriction to privatization is relevant everywhere. In fact, many Chinese SOEs have been partially privatized. In several countries, however, some of the SOEs that are left as fully state-owned might be too politically sensitive, making it excessively controversial for a government to pursue such an endeavor. One example would be Mexico's national oil company, PEMEX, as argued by Huizar (2015).

Here we focus on some companies that cannot be privatized due to political, administrative, or other considerations. This important subgroup of SOEs currently lacks a market price. These companies sometimes issue fixed-income securities, such as bonds, but not shares, since that would imply a partial privatization. But valuing these fixed-income bonds is not the same as valuing the residual cash flows of the company. The challenge is that the market valuation of fixed-income securities such as bonds only provides information about the downside risk of a business in terms of the probability of defaulting on that bond. Bond prices do not provide useful information about SOEs that are far from going bankrupt or restructuring their debt.

Still, SOE bonds are an important fraction of the global bond market. Wagner et al. (2016) show that SOEs issued $300 billion in corporate bonds, representing around a tenth of global bond issuances in 2014. Thus, these 100 percent SOEs are currently traded in public markets, but not through securities with exposure to the upside of the company. Only their exposure to downside risk is priced in fixed-income securities.

Wagner et al. (2016) show that there might be a second problem of relying on bond pricing as an indirect measure of the financial soundness of an SOE. When they compare SOEs with equivalent traded companies, correcting for many possible differences in bond valuation, they find that SOEs obtain around 30-80 basis points of lower yield to maturity, and that the effect is stronger the stronger the financial quality of the sovereign. These facts are consistent with a problem of too big to fail, in which the market expects that if the SOE defaults, the government would bail it out. Bond prices in that context would not be a good disciplining device to value the financial strength of a company, because the market seems to be pricing something else. In that sense, SOE bonds may not be useful as a proxy to get a market price for the company, neither in levels nor in changes. Currently, the Mexican government is issuing some synthetic securities[3] to finance PEMEX and the Electricity Company CFE.[4] These are the so-

[3] In applied financial jargon, a synthetic stock sometimes refers to a combination of a riskless bond and buying futures of a stock, which can effectively give a similar exposure, but at the cost of only using the margin calls. Here we are talking about something different. Thus, the idea of a synthetic security should not be confused with this existing trading strategy.

[4] See, for example, *Financial Times* Nov 5, 2015 "Mexico Tries New Way to Kick-start Energy Investment." Available at http://www.ft.com/cms/s/0/136adac0-81dd-11e5-84dc-31c8b3b18e5f.html#axzz473uFBOCB

called FIBRAS-E. They are different from the pseudo-equity contract discussed in this paper, because they are closer to what in the United States is known as a master limited partner (MLP). They are usually linked to some secure assets that obtain a stable stream of profits and/or have some type of guarantee over the asset. For example it could be used to monetize a pipeline or electricity infrastructure. MLPs are financial innovations used for SOEs, but they are not particularly helpful for getting a market value of SOE. They are for safe assets within the company.

1.3. Size of the Market for an Innovation

Without further restrictions, the potential market for an innovation is composed of all SOEs around the world. Given the characteristics of the tool, to achieve enough liquidity and analysts' attention, it would be reasonable to focus initially on SOEs that are 100 percent state-owned but at the same time are bond issuers in global markets. Table 1 lists 195 SOEs that have issued bonds in global markets. Of these, 114 firms were reporting to foreign markets. Of particular interest are firms in commodity sectors like mining or oil, as well as state-owned banks. Table 2 shows that there are 76 such companies around the world. It shows that there are a few of these companies in Africa, 31 in Asia/Pacific, and 16 in Latin America. Looking at the sum of past bond issuances, the Latin American region has the highest average per firm, with a likely skewed distribution. This analysis does not include the hundreds of firms that could use this application in a second stage but that are currently not disclosing their information to global financial markets, although they do so in domestic markets. Still, any financial instrument that pays on the underlying profitability of the company (i.e., stocks, B-shares without voting rights, or any of the synthetic assets suggested in this paper) need to have enough free floating to attract analyst coverage and liquidity, to create a meaningful price. Without that liquidity, the market price for the synthetic security would not reflect the underlying fundamentals of the SOE that we aim to price.

Overall, as can be seen in Table 2, the type of instrument discussed in this paper has applications for SOEs in Latin America, Europe, and high-income countries, as well as in Asia and a few cases of African SOEs. A focus of the initial application are companies, like PEMEX in Mexico, that have outstanding bonds for many years and therefore have almost guaranteed access to their accounting information through regulators such as the U.S. Securities and Exchange Commission (SEC).

Table 1. Descriptive Statistics of the SOEs that Issue Bonds in International Markets

	Industry classification	Frequency of firms	Percent of firms	Sum of bond issuance 1990-2012 [billion USD current]
	National agency	17	8.72	976.00
	Public administration	17	8.72	348.00
	Regional agency	18	9.23	336.00
*	Other financials	20	10.26	262.00
*	Oil and gas	7	3.59	175.00
*	Banks	34	17.44	164.00
*	Credit institutions	9	4.62	111.00
	Transportation and Infrastructure	13	6.67	81.90
	Regional government	1	0.51	53.70
	#NA	12	6.15	38.90
	Power	11	5.64	34.30
*	Metals and mining	3	1.54	20.20
*	Diversified financials	1	0.51	16.90
	Professional services	6	3.08	11.40
*	Petrochemicals	1	0.51	7.83
	Building/construction and engineering	6	3.08	5.97
	Legal services	1	0.51	5.27
	Educational services	1	0.51	4.55
	Machinery	1	0.51	3.77
	Real estate management and development	2	1.03	2.93
	Water and waste management	5	2.56	2.00
	Government-sponsored enterprises	1	0.51	1.89
	Other real estate	3	1.54	1.27
*	Asset management	1	0.51	1.16
	insurance	1	0.51	0.65
	Agriculture and livestock	1	0.51	0.26
	City agency	1	0.51	0.22
	Brokerage	1	0.51	0.01
	Total	**195**	**100**	**2670**

Notes: This table describes the SOEs that are bond issuers in international markets according to Thomson Eikon database. They are classified by industry classification. The first numerical column described the count of different firms, while the second shows the size of each bin as percentage. Industries are sorted according to the third numerical column, which is the sum of the total amount issued between 1991 and 2012 by these companies, measured in billions of current US dollars (10^9 USD). The database includes all “Agencies” with bonds outstanding in international markets. According to the author, sectors with a (*) may seem ex ante more likely, as a group, to be a potential source of demand for the innovation, because their goal seems more likely to be profit maximization, with some constrains or adjustments for externalities or strategic services. This is not a definitive statement but an exploratory one.

Table 2. SOEs of Selected Industries that Issue Bonds in Global Markets, Classified by Region of the World

World region	Frequency of firms	Percent of firms	Sum bond issuance 1990-2012 [billions USD current]
Africa	4	5.26	6.46
Asia / Pacific	31	40.79	185.00
EU and High-income	25	32.89	318.00
Latin America and Caribbean	16	21.05	248.00
Total	76	100	757.00

Notes: This table describes the SOEs that are bond issuers in international markets according to Thomson Eikon database and that belong to one of the following industries: other financials; oil and gas; banks; credit institutions; metals and mining; diversified financials; petrochemicals; asset management as classified in Thomson Eikon. The first numerical column described the count of different firms, while the second shows the size of each bin as percentage. The third column is the sum of the total amount issued between 1991 and 2012 by these companies, measured in billions of current US dollars (10^9 USD). The database includes all "agencies" with bonds outstanding in international markets that belong to the abovementioned industries.

2. The Basic Moving Parts of the Mechanism

As mentioned above, the innovation is based on the idea that two parties, potentially independent from the SOE, can trade contingent financial claims that would depend on future cash flows that the SOE pays to the treasury. For example, party A would buy a financial instrument from party B, in which B promises to pay party A an amount of **z** dollars for each dollar that the SOE pays as dividend to its owner (the State) in the future. Note that this means replicating the cash flows. It is not the same dollars that the SOE pays to the government, but it is the same amount (if **z=1**). It is replicated. The price of such an instrument, if the promise of payment is credible, would reflect the expected market valuation of the future dividends of the SOE, or a proportion X of them. The innovation would be on the application of the abovementioned method to SOEs. The practical application of this principle has some adaptations to make it work in more complex settings, as we will discuss below.

In theory, under risk neutrality the stock price represents the market valuation of the future cash flows that the company's owners expect to get. It is an expectation formed by the market. In mathematical terms:

$$P = \boldsymbol{E}\left[\sum_{t=0} \frac{Cash\ Flow_t}{(1+r)^t}\right],$$

where the expectation over all future scenarios is given by the symbol $\boldsymbol{E}$. Cash flows are uncertain, and future flows are discounted more heavily. That is why in each period there is a discount $1/(1+r)^t$ where r is the discount rate and t are the periods ahead into the future.

Sometimes the discount rate r may reflect various additional issues related to risk tolerance, correlation with the return of the reference market, liquidity, and other aspects. It can also vary over time. That is standard finance theory and is not part of our innovation.

The innovation suggested in this paper is that a financial derivative can in practice replicate the cash flows of the SOE, even if there are no true shares floating on an exchange. In some settings this is called pseudo-equity—"pseudo" because it gives access to the cash-flow rights but not to the residual control rights (i.e., no voting for seats on the company's board). The asset valuation could have some proportionality to the market value that the firm would have had if it had been floating on the market.

Each period, the SOE pays the treasury a variable amount $\$X_t$, which is recorded in a public record recognized by the market, such as the SEC. Today, large SOEs, such as Mexico's PEMEX or CODELCO, the national copper company of Chile, must file quarterly financial statements with the SEC since they will have outstanding bonds in the United States for years to come.

Therefore, based on that publicly available information, agents in the market could trade a derivative that replicates the cash flows of SOEs. Specifically, at least two parties trade a contract or a series of contracts that replicate in some proportion z the cash flow that the SOE pays to the treasury as filed with the SEC. For example, they could write a contingent contract such that for each $1 that the SOE pays to the treasury, the issuer of the derivative pays the owner of the derivative an amount $z, where z is a proportion determined ex ante, meaning before the cash flow $\mathrm{X_t}$ is realized.

The price of this contract or series of contracts would be proportional to the price that the SOE would have, had it be publicly traded

$$P^{Derivative} = E\sum_{t=0} \frac{zX_t}{(1+r)^t} \Rightarrow P^{SOE} = \frac{1}{\mathrm{z}}\mathrm{P^{Derivative}}$$

To make the proportionality in the contract translate into proportionality in market values, the cash flows from this derivative must be discounted at a rate r_t similar to the rate at which the market would have discounted the equity of the SOE. Also, the market needs to have the right expectations, or at least the same expectations about cash flows X_t that the market would have had if the SOE had been publicly traded. These conditions have practical considerations for making these synthetic securities truly represent a market value. Following are some of these considerations.

2.1. Counterparty Credibility

If the buyer of that derivative is concerned that the issuer of the derivative would not fulfill the promise of paying, then the expected cash flow would be less than proportional. Either expected cash flows would be lower than the face value z per dollar or the discount rate would be higher. Thus, for this derivative to perfectly co-move with the counterfactual SOE stock price, one needs an issuer with either deep pockets or that is naturally in a long position vis-à-vis SOE cash flows.

2.2. Analyst Coverage and Liquidity

If market information about these SOE's synthetic assets is poorer than in the case an SOE's equity is publicly traded, then this could be another reason why the price of this derivative may not reflect the true SOE value. Therefore, when designing these securities there must be sufficient market information, which could be proxied by analyst coverage. While many of these companies are already in global bond markets, equity markets are more demanding of information, especially from the upside of the business. According to Dang, Gorton, and Holmstrom (2009), bonds are more information insensitive than equity-like contracts. To get more coverage by analysts, the total amount traded of these SOE-linked-derivatives would need to be large enough; otherwise, there would not be enough opportunities to profit from trading the asset.

Moreover, the security needs to be as liquid as possible, because trading opportunities would make it profitable to gather information and, more importantly for our purposes, because a central objective of issuing an equity-like security would be to get an updated market valuation of the company. This need for liquidity asks again for having a minimum issuance size, because if the issuing size is too small there would be little turnover and the price of this synthetic security would not serve as a tool for monitoring the SOE. One potential synergy of issuing an equity-like security is that there could be more incentives to gather information about the company (Boot and Thakor, 1993). If this is the case, then there could be an additional benefit because the fixed-income bonds issued by these companies may become less volatile and could even have lower yields, decreasing the companies' cost of funding.

2.3. Incentives for the Owner

The design of this security should take into account the incentives for the owner (e.g., the treasury) to manipulate earnings as a way to avoid payments. Not all applications of the general principle in this paper's innovation generate such an incentive to earnings management.

2.4. Legal Restrictions

There could be legal constraints in the design of these synthetic securities. For example, as a device to limit lobbying by special interest groups, many countries have specific laws against earmarking some types of fiscal revenues (Bös, 2000). This might become a constraint in some countries if the judiciary interprets that replicating the cash flow of an SOE is a kind of earmarked expenditure prohibited by law. In contrast, the judiciary may interpret this as a variable debt payment, which may not be constrained by law. The central point is that before any attempt to issue the kind of synthetic security proposed in this paper, one needs to look at the legal feasibility in the country, since the ultimate payments and therefore the valuation would depend on it.

2.5. Resilience to Lobby, by Agents going Long on SOE Profits

Yet another potential concern is that the owners of the financial claim to the SOE would lobby to obtain higher dividends today at the expense of future value, if they are too impatient. This would replace the fiscal extraction problem with a "third-party's extraction problem." This does not need to be the case if the buyer of the synthetic security has ownership of cash-flow rights over multiple future periods. In that case, having an investor with the proper time horizon could be a good way to limit the so-called "fiscal extraction" problem, in which governments extract too much from the SOE, destroying its long-run value. Even if it seems unlikely in a case of dispersed ownership, if one happens to get a very impatient investor, it is important to develop ways to mitigate the negative effects of a potential lobby. In any case, such a lobby in favor of SOE profits could also be useful in counteracting[5] the potentially powerful lobby of unions, managers, or entrenched groups, which may have benefits that implicitly have a short position on the SOE's profits (i.e., capture benefits that discount the SOE's EBITDA). Having reviewed the main mechanism and trade-offs, we now turn to describing specific ways of implementing these principles.[6]

3. Implementation of The Principles

This section discusses implementation of the innovation and describes the specific steps in the process.

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[5] Thus, it can counteract lobbying in one direction with lobbying in the opposite direction, as in the political economy model of Becker (1983).

[6] Having a mechanism with a publicly available market valuation, there are ways in which owners could incentivize the management based on this valuation. There is a large literature discussing the pros and cons of having explicit formulas versus low-powered incentives to avoid the incentive contract to destroy value for the company. See, for example, Gibbons (1998).

3.1. How Can the Innovation Be Implemented?

There are various ways to implement the principle of contingent cash flows. As a starting point one can look at a so-called pseudo-equity. Pseudo-equity refers to the replication of the dividends paid to the government. This is a financial strategy that is used with some frequency in high-impact entrepreneurship, when the founder does not have cash and wants to give early employees some securities of the company, but at the same time the entrepreneur wants to avoid any veto power or negotiation from these security holders. Pseudo-equity replicates the cash-flow rights of equity, but unlike equity there is one crucial difference that can potentially make it politically more acceptable: pseudo-equity does not confer any control rights, nor does it confer ownership of the underlying asset. This is important for many cases, like the Panama Canal or CODELCO in Chile, in which ownership of the assets are restricted from being state-owned by law or even the Constitution. This proposal does not claim that a full-fledged privatization of the SOE is desirable. In many cases, this may not be the case. The point is that in some of these cases in which a privatization is not desirable, an alternative contract that gives no control rights to investors may be acceptable and desirable. This is the niche for this financial innovation, which can take various forms, as will be seen below.

An alternative would be to set up a series of swap contracts, in which promises are made annually. This means that one contract is made contingent on 2016 cash flows, another contract on 2017 cash flows, and so on. One advantage of implementing this method is that claims can be made on the differential between the dividend paid by the SOE and a benchmark interest rate (e.g., LIBOR). Using swaps means that the claims would be on the net difference rather than on the gross amounts, reducing some potential concerns about counterparty risk. This can facilitate implementation when the counterparty does not have deep pockets.

A third way to implement this principle is that the State's treasury can issue securities contingent on the SOE's profits, or the SOE can pay dividends over and above the retained earnings and standard corporate taxation. This is appealing because the treasury is generally long in the cash flows of the SOE. Therefore, this mitigates concerns about counterparty risk due to the issuer of the security being mismatched in the future. By construction, the treasury will always be matched since the $**z** of accounts payable will be hedged by $1 of cash that the treasury receives from the SOE. Mexico's Treasury is always long in PEMEX's profits, as are the Chilean Treasury with CODELCO and Panama's Treasury with the Panama Canal Authority. All applications of this method must ensure that the appropriate corrections in the contracts are made to reflect the repurchase of shares, equity injections by the majority

shareholder (meaning the treasury), and various contingencies (e.g., privatization of the company).

A fourth way to implement this principle would be to have the company provide pseudo-equity to certain people and then allow it to be traded in some way. This could be offered, for example, as part of employee retirement plans, instead of offering cash to the retirees. An application of this type would have the additional benefit of potentially aligning the incentives of SOE workers, if they know that they are truly owners of some residual cash flow rights. This pseudo-equity, however, would not be naturally liquid. These rights could be traded on a platform such as Second Market, to get a valuation of that asset.

3.2. Description of the Method Step by Step

The figures below depict flow charts of the different steps in the method. Figure 1 describes the main steps of the method and provides an overview of the whole process. There are two preliminary stages in the general process described in Figure 1. These can be considered prerequisites for a market to exist. One is the commitment to reporting, and the other is market organization.

In Stage 1, the SOE commits in some credible way to report future audited accounting statements to a market or regulator (e.g., the SEC). This commitment could be met, for example, by issuing bonds in a jurisdiction such as New York. Stage 2 is market organization. In the preliminary phase, SOE owners, stakeholders, or managers help in the process of creating a market for SOE contingent securities. Any interested third party, not necessarily related to the SOE, could also develop this process. This is akin to credit default swaps (CDS) measuring sovereign default probability, which are not issued by the same party that issues the bond. The market does not need to be organized by the sovereign or the SOE, but it can help if they participate in the process. The subsequent stages follow some periodic timing. Stage 3 describes the reporting process. In every period (e.g., quarter), the SOE would report financials and any other type of market-relevant information to regulators and analysts. In Stage 4, parties trade a financial security contingent on the SOE dividends paid to the government. Stage 5 follows a series of mathematical formulas to back out the implied SOE market price from the price of the derivative. In the case of pseudo-equity, the calculation derives from the formulas in Section 1. When the derivative is structured as a series of swaps, then more specific methods are needed to back out the SOE's valuation. Finally, as the market valuation is posted, managers and stakeholders of the SOE are expected to adapt their decisions—if pertinent—to improve the company. Figure 2 focuses on a specific case, namely, when the issuer of the

SOE-contingent security is the treasury of the government that owns the SOE, or any natural holder of the future dividends of the SOE. Figure 3 shows a process-flow diagram with an example of the payments and liquidation to be made in each period (e.g., quarter).

Figure 1. Process-flow Diagram

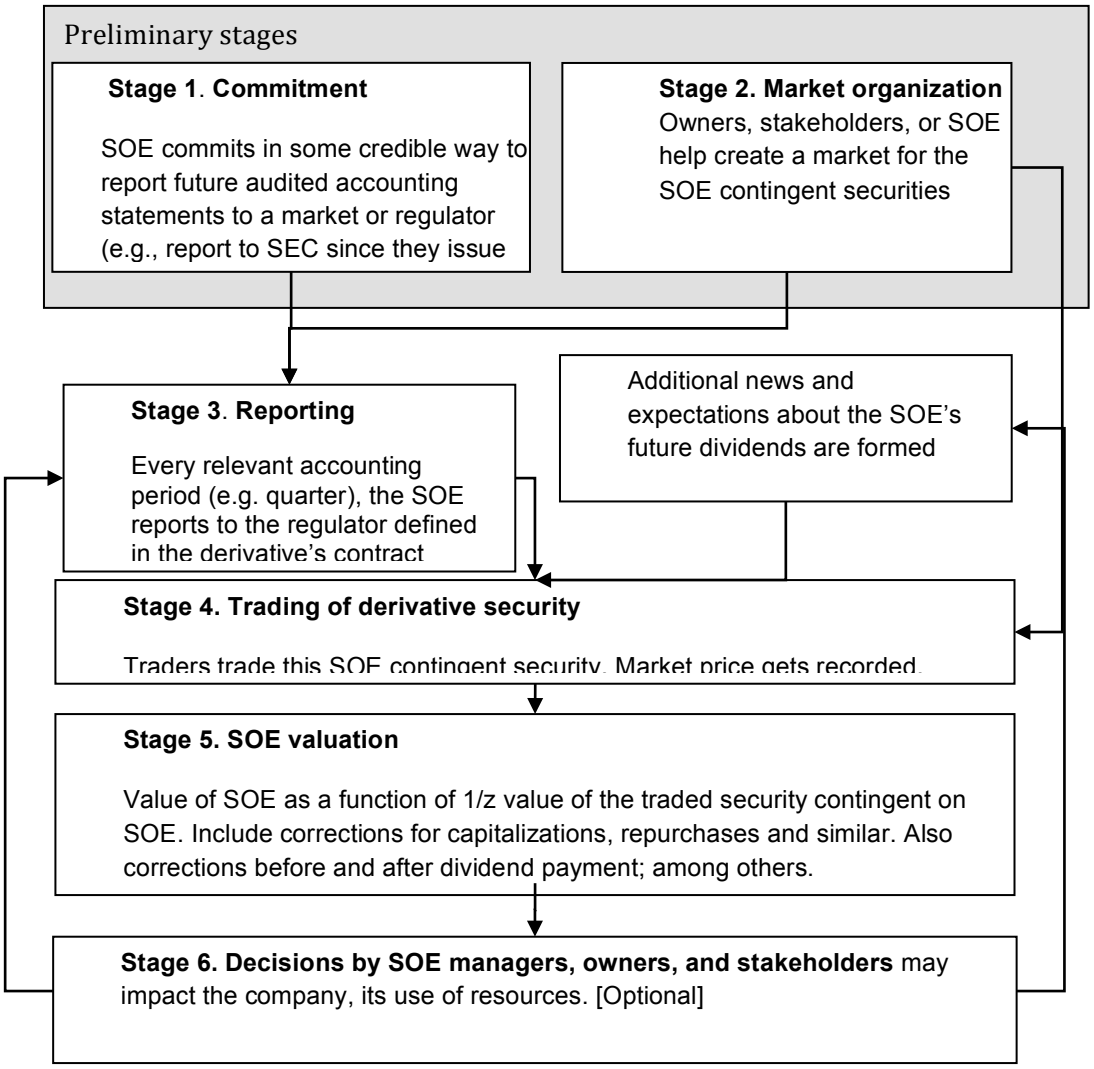


Figure 2. Special Case when the Issuer of the SOE Contingent Security is the Treasury of the Government that Owns the SOE, or any Natural Holder of Future Dividends of the SOE

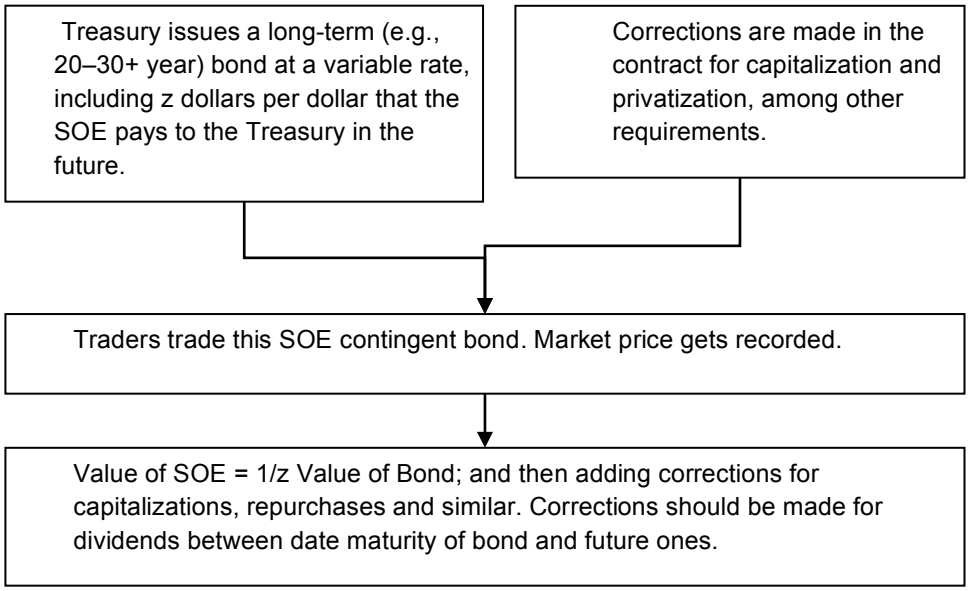
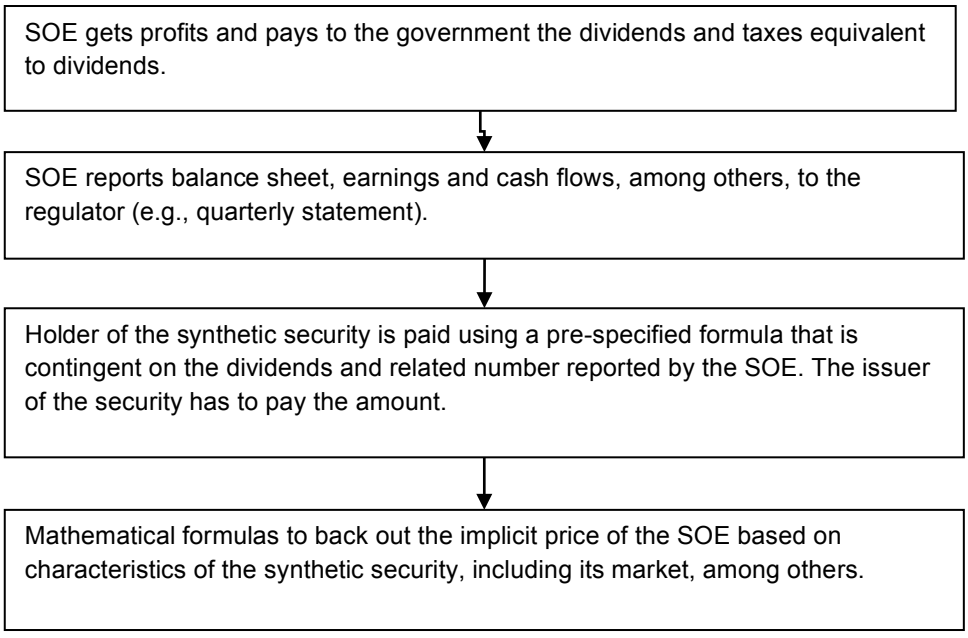


Figure 3. Process-Flow Diagram Showing an Example of Payments and Liquidation for each Payment Period



4. Opportunity and Applications

The current state of affairs seems conducive to implementing an opportunity like the one suggested here. First, after decades of privatization efforts (e.g. Latin America and post-Soviet economies), it is understood that privatization has some limitations, and not all SOEs can be easily privatized. There have been efforts to improve corporate governance in SOEs and in some cases to privatize at the margin, but this has not been a panacea. The recent corruption scandal in PETROBRAS, the partially privatized Brazilian oil company, suggests that privatizing was not enough of a vaccine against capture and signals that there will be demand for new approaches beyond partial privatization. The advantage of the method presented in this paper vis-à-vis the current technology is that companies need not be privatized to get a market valuation. While this is no guarantee against corruption scandals, it can hardly add to corruption. The hope is that it might be politically more feasible to implement the mechanism described in this paper than to float SOEs equity on a public market. The remainder of the section considers the application of these principles to particular SOEs in Latin America. This explanation cannot be considered as a complete business plan on how to proceed; rather, it is meant to provide a general idea of the orders of magnitude involved.

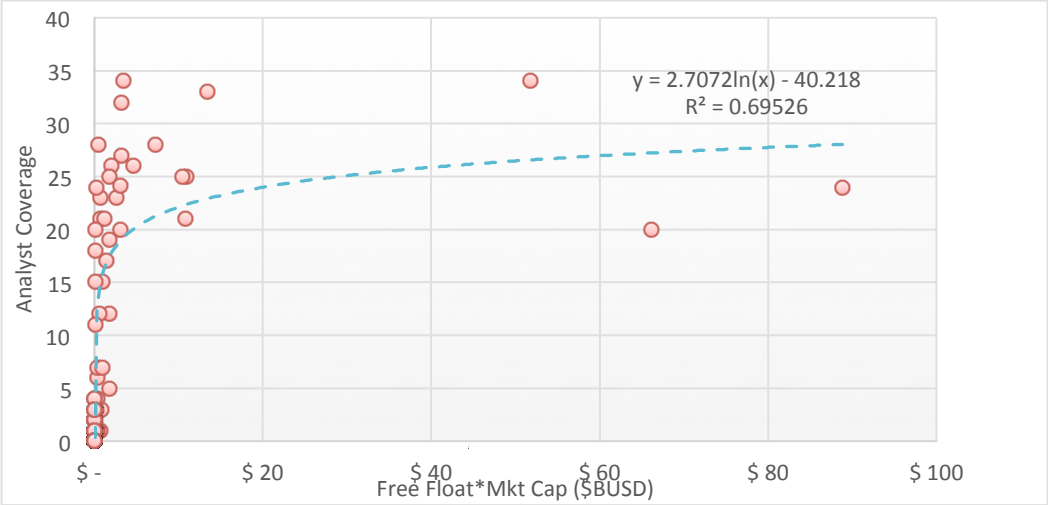
As noted in Section 1 above, it is important to have enough liquidity and analyst coverage. For this, it is necessary to have an idea of the minimum amount to issue this security. For the case of CODELCO, the estimations made jointly with Sanchez (2016) provide a starting point for various estimates of the expected valuation of that SOE, looking at multiples and various types of projections. One estimate I would use is US$20 billion, coming from at least three methods. This is not meant to be a true valuation, but rather an estimate for our exercise. Using that floating valuation as input, we can simulate the number of analysts it can get in case the pseudo-equity cash flows of CODELCO are on the market.

Figure 4 shows how analyst coverage is related to the value traded for copper companies. The plot shows on the vertical axis the analyst coverage for publicly traded copper companies, going from none to 35 analysts for their shares. On the horizontal axis, the plot shows the value of the floating shares for these companies. This is obtained multiplying the percent of free-floating by the market capitalization. From Figure 4, it is apparent that at around US$2 to US$5 billion in floating market cap, companies get around 20 analysts. More formally, when inputting the assumed valuation of CODELCO of US$ 20 billion and the assumed 10 percent floating, one gets around that predicted number of analysts (the point estimate is 21.4 analysts). Other multivariate models that include more covariates yield a similar order of magnitude for a 10 percent floating share of this synthetic security.

One variable that is significant in the analysis to predict analyst coverage in copper (regressions available upon request) is the market in which the shares are traded. Shares traded on the London Metal Exchange have, ceteris paribus, eight more analysts than those traded in benchmark countries. This are still three more analysts than there are for issuances traded in North America.

One implication of this result is that to get more analyst coverage, it is possible that shares should not be traded in the domestic market where the SOE is located, but rather in a stock market that understands its industry and has more coverage. Although not conclusive, this is a first warning on the nationalistic view that if any, SOE shares should be traded in the same country. Overall, as an order of magnitude, having 10 percent of CODELCO's cash flows could in principle be enough to attract analyst coverage. It would have as much coverage as a medium-sized copper mine listed in the UK or Canada.

Figure 4. Analyst Coverage and Market Cap adjusted by Free Float for a Group of Publicly Traded Copper Miners that can be Compared to CODELCO



Source: Sanchez dissertation (2016) using data from Bloomberg on *Analyst Coverage*. The plot shows on the vertical axis the analyst coverage for publicly traded copper companies. On the horizontal axis the plot shows the value of the floating shares for these companies. This is obtained by multiplying the percent of free-floating shares times the market capitalization. Most companies are in the range between US$0 to US$15 billion. The three companies of the right-hand side are BHP Billiton PLC with $89 billion, Rio Tinto PLC with $52 billion, and Rio Tinto LTD with US$66 billion on the horizontal axis.

Similar calculations could be performed for commodity companies like PEMEX. In that case, one needs the analyst curve for oil companies instead of copper companies. A preliminary estimation showed a similar curve. The difference is that PEMEX is a much bigger company. As a result, with a smaller share of PEMEX, a US$2 to US$5 billion floating market capitalization is possible. This means that this method could be more easily applied to PEMEX than to CODELCO, because of the size.

One challenge, as can be observed, is that the bust of commodity prices may have reduced the value of both CODELCO and PEMEX, making it harder to jumpstart a system of analyst coverage and trading of pseudo-equity. It would be advisable to have a plan ready for the moment when commodity prices jump back to their previous high levels. Still, one can aim for a smaller amount floating and still get relevant signals of market value.

It is illustrative to see a rough calculation for the Panama Canal. The Canal has current profits of around US$1 billion. Roughly, these profits could be discounted at 7 percent, which is a rate used for some internationals ports. Assets would be valued at US$14 billion, assuming no growth or that all the growth goes to pay for the expansion. In such a simplistic scenario, which does not correct for many of the real-world complications—including debt[7] and taxes—a 5 percent floating would be $700 million. That amount corresponds to one and a half times the free float of Eurotunnel (*Groupe Eurotunnel SE,* code GTP.PA), the company that operates the tunnel between France and the United Kingdom, which currently has some seven active analysts following the stock and it is reasonably liquid. This approximation is not meant to be precise, but rather to give an order of magnitude of what could be achievable for the case of the Panama Canal. We are not saying this is necessarily a good project for Panama; but it is reasonable to make a more serious evaluation about ways to issue either bonds contingent on the profits of the Canal, or B-shares without voting rights, or any of the other possibilities of pseudo-equity discussed in this paper. All these alternatives may have the potential to be less politically controversial than simply floating shares in public markets.

5. Concluding Remarks

SOEs can be both systemically and politically important for many economies. While an important share of these firms have been privatized in recent decades, for various reasons many of them are likely to remain 100 percent state-owned, which prevents them from getting a market-based valuation. Having a market signal for the value of SOEs could be desirable because it could help the treasury in its fiscal planning and the managers for discipline and

feedback; it can potentially discipline entrenched groups, and it can also help in the valuation of R&D and discovery, or any other investment that is slow to show results.

This paper presents a new mechanism to create a market value for SOEs that cannot have publicly traded equity. It suggests trading some pseudo-equity. It is based on the idea that parties, potentially independent from the SOE, can trade contingent financial claims for future cash flows that the SOE pays to the government. Technically, it is a set of Arrow-Debreu securities that can mimic the SOE's cash flows. The mechanism can be implemented as pseudo-equity by third parties with deep pockets. However, it is important to limit counterparty risk. For this reason, it might be desirable for an agency like the sovereign of a country to issue some SOE-linked bond, since the sovereign is the owner of the SOE and therefore naturally long in the SOE's dividends. It can also be useful as a diversification tool.

Preliminary calculations show that by floating 10 percent of CODELCO, one could get enough analyst coverage for this synthetic instrument if the market perceives it as equivalent to the dividends received by a minority shareholder in a mid sized-copper mine. For PEMEX, since the company is larger, the floating shares of this pseudo-equity are expected to be much lower. According to calculations a floating share below 2-3 percent it can get enough analyst coverage. The numbers are gross estimates. With respect to the Panama Canal Authority, we have found comparable firms with decent coverage and liquidity despite a smaller free float, such as the Eurotunnel. A 5 percent of the Authority's pseudo-equity—without voting rights—could be a starting point to get a market price for its net present value.

Although the pseudo-equity approach may still have various challenges, it is another alternative in the toolbox for SOEs, especially those large companies facing political or strategic considerations that prevent governments from floating common stock. One can still get around this constraint and get a market-based price that could help monitoring SOEs value.

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Appendix

Table A1. Listing Markets for SOE Bonds Traded in Global Markets for all Industries in the Database

Listing market for bonds	Frequency of bonds	Percent of bonds	Cumulative percent
Frankfurt	1,100	44.64	44.64
Luxembourg	436	17.69	62.34
Singapore	157	6.37	68.71
London	109	4.42	73.13
Euronext.liffe Paris	99	4.02	77.15
Euronext.liffe Amsterdam	81	3.29	80.44
Mexico	49	1.99	82.43
Dusseldorf	48	1.95	84.38
Japan OTC	43	1.75	86.12
Cairo	38	1.54	87.66
Johannesburg	28	1.14	88.8
Berlin	22	0.89	89.69
Gretai Securities	20	0.81	90.5
Vienna Stock Exchange	18	0.73	91.23
Munich	17	0.69	91.92
Bond Exchange South Africa (BESA)	16	0.65	92.57
Hong Kong	16	0.65	93.22
Stockholm	15	0.61	93.83
Mercado Deuda Publica	13	0.53	94.36
Stuttgart	13	0.53	94.89
Euronext.liffe Lisbon	11	0.45	95.33
Dublin	10	0.41	95.74
New York Stock Exchange (NYSE)	10	0.41	96.14
Others	95	3.86	100.00
Total	2,464		100.00

Note: This table describes the listing market for the bonds issued by SOEs. It includes all industries in the Thomson Eikon database. The first numerical column describes the count of different bonds issued in each market between 1991 and 2012, while the second shows the size of each bin as a percentage. The third is the cumulative percentage. The total number of SOE firms is 195. The listing markets for bonds in the last residual category called “Others” includes: Tokyo Stock Exchange; Milan; Toronto; Barcelona; Kuala Lumpur; Swiss Stock Exchange; Athens; New Zealand; Buenos Aires; Cordoba; Euro MTF; Helsinki; Warsaw; Madrid; Budapest Stock Exchange; Copenhagen Stock Exchange; Euro TLX; Casablanca; CeTO Regulated; Korea Stock Exchange; NASDAQ; and Taiwan.