



The Valuation of IPOs in a
Privatization context: A real options
approach

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Biographical Note

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Abstract

The decision to privatize a State-owned Enterprise (SOE) and the Privatization policies executed by Governments have been and are expected to continue to be discussed each time a relevant company becomes an hypothesis to be privatized. This dissertation intends to model an Initial Public Offering in the context of privatization in order to find the value of such operation, implementing also the model with real cases. As the decision process to privatize a SOE is such a complex procedure, this model, the breakthroughs brought by it and the broader and more complete view that it offers, is something that can position itself as completely pertinent and supportful for future privatization policies, bringing important insights to the decision making process regarding privatizations, as there are rather few scientific publications that links a real options approach and IPOs. Concerning the application of the models, the IPO deals on the privatization of Royal Mail and CTT were the ones used to test and exemplify the models.

Key-words: Real Options, Privatizations, IPO.

Sumário

A decisão de privatizar uma Empresa Pública e as políticas de privatização executadas pelos Governos têm sido e continuarão a ser alvo de debate sempre que uma empresa relevante se torna expectável que seja privatizada. Esta dissertação pretende modelar uma Oferta Pública de Venda num contexto de privatização de forma a avaliar uma operação deste tipo, implementando também o modelo usando casos reais. Sendo a decisão de privatizar uma Empresa Pública um procedimento tão complexo, este modelo, pelos avanços que oferece em relação à literatura existente e pela perspetiva mais completa e abrangente que oferece, é algo que se pode posicionar como completamente pertinente e um suporte rico para futuras políticas de privatização, trazendo uma importante perspetiva para o processo de tomada de decisão em relação a privatizações, uma vez que há relativamente pouca literatura científica que agrega OPVs e opções reais. Em relação à aplicação dos modelos, as OPV da privatização da Royal Mail e dos CTT foram os casos usados para exemplificar e testar os modelos.

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1. Introduction

This dissertation aims to study the value of the option included in the privatization deal of a State-owned Enterprise, SOE, to go public through an Initial Public Offering. In a way to investigate how profitable can the deal be for the public accounts in each case, meaning the real value of the Option at the disposal of the State, it is investigated the Critical Value for the pursuit of the deal, assessing if the operation is optimal to go through or if it would be more beneficial to defer the IPO. With that being said, the dissertation will be strongly related with Privatization contracts and IPO deals, while containing a Real Options approach.

This theme of the privatization deals is always a reason for generating a lot of debate because of the importance and the pride, towards the SOE, and also the possible benefits for the clients that a public company may imply, which in the case of being considered to be passed to the hands of a private investor always produce a big emphasis. So, this is a topic that is discussed from time to time in almost every country of the world, and has the potential to keep attracting attention for new cases and other countries that never passed through it. Although this is a project that incorporates Real Options with an approach that is not so accessible to the general public and to the common treatment of analysis by the press, it can bring a more accurate insight to this kind of deals and make an impact to the way the deal is scrutinized.

So the purpose of this dissertation is to analyze the privatization deals that are performed with an IPO, to calculate the outcome that the Option of the IPO, and therefore the deal, can generate for the public accounts of a country, taking into consideration the several variables of this Option. It is also considered the timing for the pursuit of the operation, since the governments are dependent on the market conditions, they face a timing problem, and therefore they should consider the delay of the operation if that results in an increase of the company market value, or at least if by the time the operation is being planned to go through, it is not optimal do proceed with the IPO.

I can say that this is a relevant topic, because as it is something that is persistently appearing on the news and that can be in the order of the day for several months, this work can lead to breakthroughs to a pertinent matter, supporting the analysis of this kind of deals. Also, although there is some research on Privatizations and IPOs, linking these

two topics plus approaching it with a more realistic and trustful process with the resource of real options, the means followed in this dissertation are not reproduced or found in many publications. So, even though there is some scientific research and studies to the specificities of this kind of contracts, this approach is not very common, especially by being linked with privatization contracts and real options, turning this study into a pertinent work. Also, this study can lead to further findings in the researched areas.

To give a clearer and broader view of the history of privatizations, according to Parker and Saal (2003) the beginning of its history goes back to the Ancient Greece, where the trade-off between the benefits of SOEs and private firms were already considered, and depending on the politic and economic principles of the governments, there were more or less privatizations and nationalizations as well. Regarding more recent years, with a special look to the final decades of the twentieth century and for the case of the United Kingdom, after some privatizations on the Churchill's government, there were a high tendency to privatize major state-owned firms, such as the British Telecom or British Gas, through public-share offerings. Concerning the case of Portugal, in the recent years there has been some deals to privatize SOEs, such as EDP, TAP or CTT. Using the CTT example, the Portuguese postal services company, there has been a major trend to privatize the public-owned companies of this sector on a worldwide scale. In the past 5 to 10 years, Royal Mail was privatized, Japan Post is in the process of privatization and Poste Italiane sold a minority stake of its shares, while in the United States there has been some debate over the possible privatization of US Postal and the advantages this could bring.

Regarding the Initial Public Offerings, it is mainly used to raise capital and to exploit the advantages of being a public-traded company, and there is evidence of a simpler form of this operation even in the Roman Empire. Nowadays it is a very common operation, for private firms or public-owned firms, and it is particularly usual in the biggest economies that are experiencing consistent economic expansion, such as China, and it is also usual in sectors that are facing major expansion and that live with some hype regarding its potential, such as Internet-related companies.

Apart from this section the dissertation is organized as follows. In the next section, I am going to present comprehensively the literature that I reviewed and used up until now. It is followed by the presentation of this dissertation methodology, displaying the

model development, and performing an analytical sensitivity analysis. The Chapter 4 is reserved to the applications of the model, starting with a presentation of the real cases used, followed by the display of the data for the cases and the implementation of the model, and performing also a sensitivity analysis for the results achieved. From there, it is only missing the conclusions and findings, and the last chapter is for the references used in this dissertation.

2. Literature Review

The privatizations have been discussed and analyzed in the last decades by some researchers, and also this is a matter that have stimulated important public policy debates across the world, linking it specially with politic and economic ideologies, and so there are some information and studies concerning this topic.

Among the researchers, Yarrow (1986) presented the theory and practice of privatization, performing one of the first studies on privatization, comparing the private and public ownership and examining deeply the implications of privatizations to the society and the empirical evidence that existed by that time. Vickers and Yarrow (1991) published a study on privatizations where they aim to answer several questions, about the benefits in performance and implications of privatization, and they do that by taking into consideration three different types of privatization, being the privatization of competitive firms, privatization of monopolies and contracting out of public financed services, and scrutinize the relevance of each in each given country.

There is some literature that studies specific characteristics or subjects of privatizations, apart from the general theory of implications and benefits of privatizations. Schmidt (1996), for example, addressed the issue of incomplete contracts in privatization deals. He starts, supported by the literature of incomplete contracts, by assuming that complete contingent long-term contracts cannot be written and that affects and limits the bargaining power and procedure that can be followed by the government. Also, Megginson and Netter (2001) published about privatization contracts, with a survey of empirical studies on privatizations; they study the historic of privatizations, from the 1980's where privatization deals became much more common to the end of the century, and they attempt to answer the question of what the literature reveals about the several aspects of privatization as an economic policy, ending by presenting several lessons they took from the privatization research. Cragg and Dyck (2003) gathered evidence from the United Kingdom on how the privatizations affects management incentives, finding no correlation between compensation and financial performance in SOE's, but finding the opposite for privatized firms, noting an increase in management returns for a better firm performance.

Like other authors presented, Kikeri and Nellis (2004) made an overall and fresher assessment on privatization, studying the benefits of this kind of operations, confronting with the microeconomic harm that it can cause and the arguments of the opposition from, mainly, the citizens, and it also examines the empirical evidence that exists on privatization and the improved performance that is manifested, and they also state the importance of the right method when privatizing a firm. Regarding the studies on the performance of companies after being privatized, there are numerous publications that collect empirical evidence and observe the differences in performance in the pre and post-privatization. Megginson, Nash et al. (1994) studied the financial and operating performance of newly privatized firms with an internationally empirical analysis that gathered dozens of privatization cases during the period of 1961 to 1990, with the final results being proof that the privatization of this sample of companies helped them reach a more competitive position, with increased sales, improved efficiency and so on. Later D'souza and Megginson (1999) made a similar study for the 1990 decade and their conclusions were equivalent to the ones named previously. Finally, Mathur and Banchuenvijit (2007) also examined the effects on the performance of companies after privatization. They provided a consistent study where they examined worldwide firms of emerging and developed markets that were privatized in a range of 10 years and examined the changes in the financial and operating performance, achieving results that support the political and economic decision of privatization of firms by showing that privatization helps improve firm performance, discovering for example increases in profitability and operating efficiency and decreases in leverage.

Concerning the privatizations deals and contracts, it is important to consider the flexibility of the several lines of the contracts when assuming the values included in the options and the aftermath of each option. As there is few literature joining privatization contracts and real options, there is few research that take this factor into consideration when valuing privatization contracts, which also happens to the uncertainty and irreversibility of these cases, so the real options approach that I am going to follow allow me to go deeper and more accurately on this valuation.

The first to introduce the real option term and pricing approach were Myers and Turnbull (1977), opening a new perspective in investment analysis, explaining the usefulness of the CAPM model but mainly presenting the flaws of this technique.

However, before this Black and Scholes (1973) developed and introduced a theoretical valuation formula for options that can also be applied to corporate liabilities. This marked a breakthrough and a considerable evolution in valuing options, working for both call and put types of options, however this cannot be truly identified as part of real options literature. Myers (1984) also pointed out that DCF techniques have failures in evaluating investments that has flexibility implied in it and investigated the gap between strategic and financial analysis, exhibiting misapplication of finance theory. Practically the same is referred by Trigeorgis (1996), enhancing the importance of both operating flexibility and strategic flexibility on valuation and planning decisions, stating that there are always several options at the disposal of the investors/managers that can be exercised or not depending on the strategy applied. Regarding McDonald and Siegel (1986), they were the first to develop a real options valuation model, following the main variables a geometric Brownian motion and using the option pricing approach, studying the optimal timing of investment in an irreversible project, showing in simulations that this option value can be significant, and that it might be optimal to wait until the benefits reach a relevant value comparing to the costs. Also Dixit and Pindyck (1994) brought a deeper presentation about an investment, the three characteristics (flexibility, uncertainty and irreversibility) that most investments share and that determine the optimal decisions that an investor should take and bring additional value to the investment. These last authors brought a huge contribution to this area of research, and some of the insights present in their publication were fundamental for the development of the methodology of this dissertation.

There are few studies that connect the privatizations contracts with a real options approach, which can give some insights and guidelines to the methodology I want to follow in this dissertation. So, there are some valuable information that can be taken away from this literature. Pennings (2008) studied the characteristics of real options that many privatization objects have, such as the initial investment and the uncertainty regarding the future value of the asset that was privatized. He examined several auction types of privatization and how it impacts the government revenues from the deal. Chavanasorn and Ewald (2012) study the situation of the opportunity to invest flexibly in a SOE by an investor through a partial privatization, and through a real options approach they attempt to determine the optimal time for the private company to perform the initial investment

and the optimal investment strategy that it follows as well. They also investigated the optimal degree of privatization from the government's perspective.

Although relevant literature were already presented, the basis, the main reference for this dissertation is studies on Initial Public Offerings, the valuation of this operations, and there are already some publications that link this kind of operation with a real options approach. Draho (2000) in an unpublished paper presented breakthroughs in this area of research, by treating the decision to go public as a real option, and although it was unpublished research, it is cited by numerous articles published in reputable journals. In order to do that, they derived and applied a model that intends to calculate this option, and take into account the appropriate timing for the pursuit of the operation, considering the market valuation for the sector of the company and for the company itself, and this approach served as the main basis for the development of my methodology. They developed their model considering a stochastic profit flow, and also a deterministic one for a less complex case. Furthermore, it was presented the case for multiple equity issues and the timing and the option to withdraw from the going public operation. Brada and Ma (2007) also developed a publication with an identical concept, deriving a model to estimate the optimal timing for an IPO in a privatization process, however, although it brings some relevant additions in methodology for a model of that purpose, some of the development, assumptions and later on the data treatment for the numerical cases, seems to be wrong. Later on, Bustamante (2011) addressed this topic with similar basis, taking into consideration the optimal timing to go public, but also approaching the signaling intention on option exercise strategies and the announcement effects on outside investors. A more parallel approach was conducted by Pástor and Veronesi (2005), where they considered the waves over the number of firms going public, and how it affects the optimal timing to proceed to an IPO creating a model that considers this factor.

In order to make a deeper analysis on IPOs and to understand the characteristics and motivations of such operations, it is presented some literature that studies IPOs at all levels. Brau and Fawcett (2006) study the motivation, timing, underpricing, signaling and other specifications of IPOs, with an analysis of the theory of IPOs and these operations in practice, concluding about the principle motivations, the tendency for underpricing situations, and a lot more. Some years before, Pagano, Panetta et al. (1998) addressed the reasons for the companies to go public and the consequences of such decision, comparing

the characteristics of them before and after the operation. Just before the named authors, the aim of Röell (1996) was similar, but analyzing also the discrepancies on the intention to go public between different countries. Apart from this, there are a lot more specific publications that address questions like the tendency for underpricing in IPOs, the roles of the agents of the operation, the performance after the companies go public compared to the ones before the pursuit of the operation, and several more specificities of IPOs.

Concluding, in what matters to the literature existing, there is considerably relevant research to sustain the theme, especially in what matters to the literature that is going to be the basis of my methodology. However, as there are some additions to the models already studied and published, it is necessary to follow a new path that has never been taken, and so there is a need for autonomous work in order to achieve the aim of the dissertation.

3. Model Development

The model developed in this chapter is based on Draho (2000). For the development of this model, we assume that π , the profit flow of a company, behaves stochastically according to a geometric Brownian motion (gBm, which is a continuous-time stochastic process in which the logarithm of the randomly varying quantity follows a Brownian motion (also called a Wiener process) with drift), and the stochastic nature of the variable is explained by the uncertainty on the conditions of the capital markets and possible shocks that might occur that affects the evolution of the firm's profit flow, and consequently, its value. So, presenting the geometric Brownian motion expression:

$$d\pi = \alpha\pi dt + \sigma\pi dz \quad (1)$$

where $\pi > 0$, α corresponds to the trend parameter (the drift) and σ to the instantaneous volatility. Additionally, $\alpha = \mu - \delta$, where μ is the risk-adjusted required rate of return and $\delta > 0$ represents the dividend yield from investing in the firm; finally dz is an increment of the Wiener process.

The value function for the option to privatize through the IPO, $F(\pi)$, must satisfy the following ordinary differential equation (ODE):

$$\frac{1}{2}\sigma^2\pi^2 F''(\pi) + (r - \delta^G)\pi F'(\pi) - rF(\pi) + \lambda\pi = 0 \quad (2)$$

This equation is based on Dixit and Pindyck (1994), used there for valuing an option to invest, and this is subject to some conditions that must be imposed, in order to obtain the appropriate solution. For each case, the fraction of the company that is put to sell in the market can vary and that is given by λ , which obviously obeys the following, $0 < \lambda \leq 1$. Furthermore, there is the first appearance of a variable that is written with the exponent G or m . That means that such variable is linked and gives respect to the context of the company being state-owned or public, traded in a capital market. In this case, in the general solution the fraction of the company profits' that are due to being privatized are discounted by the dividend yield from investing in the company as a SOE.

As Equation (2) is a homogeneous linear equation of second order, as stated by the authors, the general solution for this ODE is a combination of any two linearly independent solutions, so it takes the form:

$$F(\pi) = A_1\pi^{\beta_1} + A_2\pi^{\beta_2} + \lambda \frac{\pi}{\delta G} \quad (3)$$

where A_1 and A_2 are arbitrary constants that need to be determined, and β_1 and β_2 are the roots of the fundamental quadratic that was obtained through the ODE presented previously, Equation (2).

So, as presented in the Equation (3) two constants must be determined (A_1 and A_2), so two conditions are necessary, but a third one will also be needed. In fact, we must determine the optimal trigger to perform the operation (defined as π^*) for which is optimal to undertake the IPO. So, in final, for solving the problem, the three boundary conditions are:

$$F(0) = 0 \quad (4)$$

$$F(\pi^*) = \lambda \frac{\pi^*}{\delta m} (1 - \theta) - C \quad (5)$$

$$F'(\pi^*) = \lambda \frac{1}{\delta m} (1 - \theta) \quad (6)$$

Before presenting the meaning and importance of each boundary condition, in an IPO deal the obvious thing is to have implicit costs for the pursuit of the deal. There are the variable ones, given by the underwriting fees and traduced in the model by θ , and that are a percentage of the issue proceeds. This percentage depends on several factors, like the amount of proceeds, the market of the operation and some more that make it vary from deal to deal. The other part of the expenses are the fixed costs of the operation, like administrative costs and legal expenditures, and that is presented by C .

The first boundary, Equation (4), ensures that the value of the option to perform the IPO tends to zero as the profit value of the operation goes to zero. The second boundary, Equation (5), usually called "value-matching" condition, says that, for the level of π at which is optimal to proceed the operation, the value of the option must equal the net value that the public accounts receive by privatizing the company. Here it is used the other dividend yield that is applied in the model, the one that demonstrates how much cash flow is received for each dollar from investing in the company that is now traded in the capital markets. Finally, the Equation (6) represents the last condition that is known as "smooth-pasting" condition and ensures that the two value function tangentially meet.

In order to respect the Equation (4), the first boundary condition, A_2 must be set equal to zero. Therefore:

$$F(\pi) = A_1 \pi^{\beta_1} + \lambda \frac{\pi}{\delta^G} \quad (7)$$

Being now the construction of the model left with the two remaining conditions, these are the ones that allows to find the other unknowns, the constant A_1 and the trigger value:

$$F(\pi) = \begin{cases} \left(\lambda \frac{\pi^*}{\delta^m} (1 - \theta) - C - \lambda \frac{\pi^*}{\delta^G} \right) \left(\frac{\pi}{\pi^*} \right)^{\beta_1} + \lambda \frac{\pi}{\delta^G}, & \pi < \pi^* \\ \lambda \frac{\pi}{\delta^m} (1 - \theta) - C & , \quad \pi \geq \pi^* \end{cases}$$

After some standard calculus and derivation of the model, the equation that ensures the optimal timing to proceed with the IPO and the privatization of the company, the trigger value of the value function, is as follows:

$$\pi^* = \frac{\beta_1}{\beta_1 - 1} \frac{C}{\lambda \left(\frac{1 - \theta}{\delta^m} - \frac{1}{\delta^G} \right)} \quad (8)$$

and β_1 is equal to:

$$\beta_1 = \frac{1}{2} - \frac{r - \delta^G}{\sigma^2} + \sqrt{\left(\frac{r - \delta^G}{\sigma^2} - \frac{1}{2} \right)^2 + \frac{2r}{\sigma^2}} \quad (9)$$

3.1. Mandatory conditions of the model and for economic intuition

Going back to the Equation (9) that solves the trigger value for this operation, the following condition is mandatory:

$$\frac{1 - \theta}{\delta^m} - \frac{1}{\delta^G} > 0 \quad (10)$$

To firstly introduce this issue and the assumptions made to solve the question, I will take the case where there is no underwriting fees, so $\theta = 0$. With that said and from the previous condition, it is easy to note that the dividend yield of the government must be higher than the one of the market.

$$\delta^G > \delta^m \quad (11)$$

From what was shown right on Equation (11), and taking into consideration that $\delta = \mu - \alpha$, implying also that $\delta^G = \mu^G - \alpha^G$ and $\delta^m = \mu^m - \alpha^m$, it is straightforward to realize that $\mu^G - \alpha^G > \mu^m - \alpha^m$ means the same. With that, an important assumption made is that a Government demands a return that equals the one of the market, or the private investor, return that is related with the risk of the business, and that is explained

by the way the Government manages the firm, with an intent of maximization of profit and value. All that means that the required rate of return of the State is the same of the market, $\mu^G = \mu^m$.

Assuming now the more realistic case where there are effectively underwriting fees in the IPO deal, $\theta \neq 0$, from the condition previously presented on Equation (10), with a few solving steps it leads to the following expression:

$$\delta^G > \frac{\delta^m}{1 - \theta} \quad (12)$$

Once again, taking into consideration that $\delta = \mu - \alpha$ and that $\mu^G = \mu^m$, implying also that $\delta^G = \mu - \alpha^G$ and $\delta^m = \mu - \alpha^m$, it is calculated the condition that states the feasibility of the solving equation for the trigger value.

Summarizing the latest conclusions and presenting the final conditions that support and guarantees that π^* has economic reasonability, for $\theta = 0$ it is only required to meet the following inequation:

$$\alpha^G < \alpha^m \quad (13)$$

This phenomenon, that the private sector is able to reach higher growth rates than the public one, is presented, explained and proved by some literature. Mathur and Banchuenvijit (2007) found empirical evidence of positive changes in profitability, efficiency, capital investment, leverage and payout ratios across 103 worldwide firms that were privatized through public share offerings during a decade, from 1993 to 2003. Barbosa, Carvalho et al. (2016) studied the several hypothesis of public stimulus for private investment using a real options approach, and they assumed certain public inefficiency in relation to the private sector, supported by a citation of Afonso, Schuknecht et al. (2005) stating that the public investment could be smaller and more efficient, being the transfer of non-core activities to the private sector a fundamental condition.

So, for the case where there are underwriting fees, $\theta \neq 0$, the following condition must be respected:

$$\alpha^G < \frac{\alpha^m - \theta \mu^G}{1 - \theta} \quad (14)$$

3.2. Analytical Sensitivity Analysis

In order to analyse properly the influence of the key variables and the way each of them impacts the final results, it is fundamental to perform an analytical sensitivity analysis. So, with that said, the variables that were considered key to the final results were π , δ^G , δ^m , σ , C and θ .

So performing this analysis to the Value Function of the IPO and presenting the derivation and graphic distribution of the arbitrary values, it is found the following:

$$\frac{\partial F(\pi)}{\partial \pi} = \frac{\lambda}{\delta^G} + \frac{\left(\frac{\pi}{\pi^*}\right)^{\beta_1-1} \beta_1 \left(-\lambda \frac{\pi^*}{\delta^G} + \lambda \frac{\pi^*(1-\theta)}{\delta^m} - C\right)}{\pi^*} > 0 \quad (15)$$

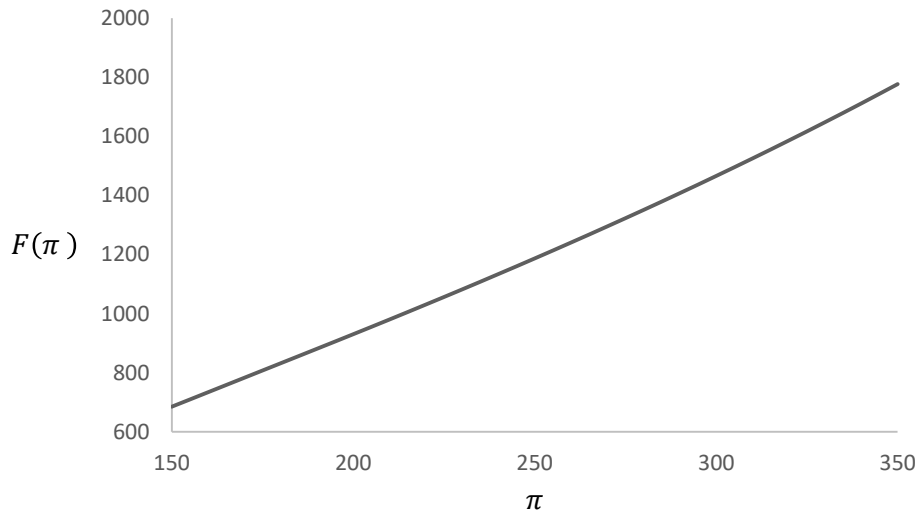


Figure 1: Profit flow influence on the IPO Option

First of all, studying the impact of the cash flows on the value of the IPO deal, it can be concluded that the cash flows are positively related with the deal value, as it should be. The intuition that the higher the value of cash flows, the higher the Value of the Option to privatize through the IPO, is relatively straightforward.

$$\frac{\partial F(\pi)}{\partial \delta^G} = \frac{\partial F(\pi)}{\partial \beta_1} \frac{\partial \beta_1}{\partial \delta^G}; \frac{\partial F(\pi)}{\partial \beta_1} > 0; \frac{\partial \beta_1}{\partial \delta^G} > 0 \quad (16)$$

$$\frac{\partial F(\pi)}{\partial \delta^m} = -\lambda \frac{\pi^*(1-\theta) \left(\frac{\pi}{\pi^*}\right)^{\beta_1}}{\delta^{m^2}} < 0 \quad (17)$$

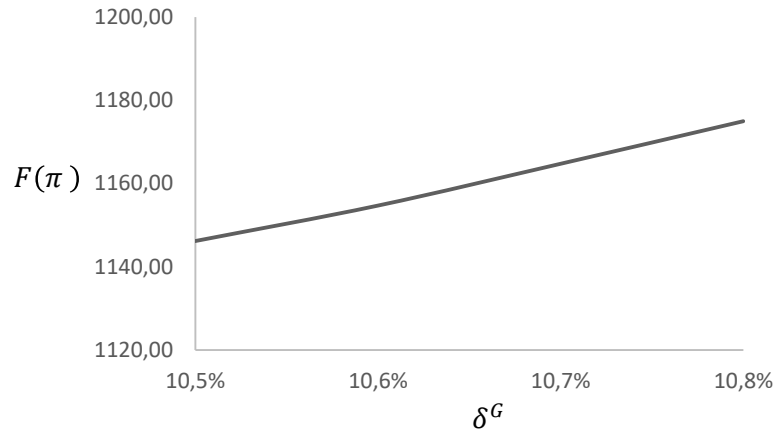


Figure 2: Public dividend yield influence on the IPO Option

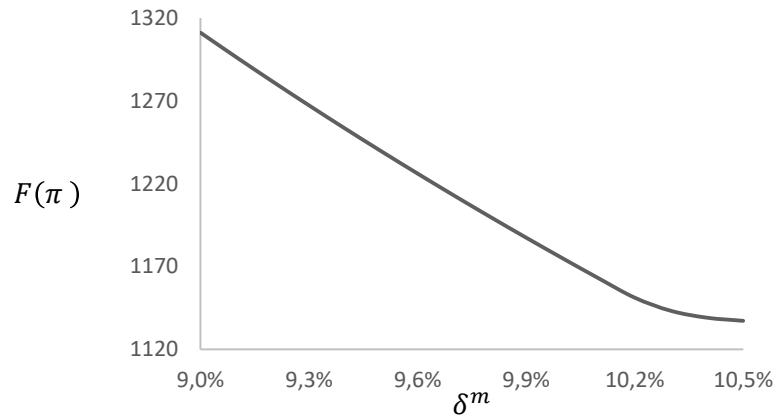


Figure 3: Market dividend yield influence on the IPO Option

Regarding the dividend yield of the government and the one of the market, the variables affect the valuation in opposite ways. The government dividend yield is positively related with the value of the deal, influencing only the Value Function when the profit flow is lower than the Critical Value, while the market dividend yield is negatively related to it.

$$\frac{\partial F(\pi)}{\partial \sigma} = \frac{\partial F(\pi)}{\partial \beta_1} \frac{\partial \beta_1}{\partial \sigma}; \frac{\partial F(\pi)}{\partial \beta_1} > 0; \frac{\partial \beta_1}{\partial \sigma} > 0 \quad (18)$$

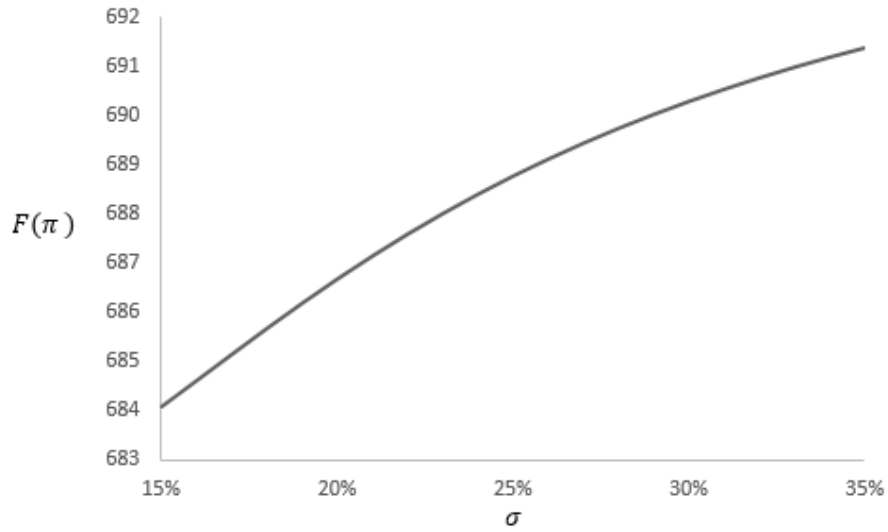


Figure 4: Volatility influence on the IPO Option

Concerning the relationship of volatility with the Value of the IPO Option, it is determined to be a positive one. The higher the uncertainty linked to the company operations, the higher the value of the operation. However, this only works and it is pertinent for the case where the profit flow of the company is lower than the Critical Value, when this is not the case, the volatility simply does not influence the Value Function, much like what happens with the public dividend yield.

$$\frac{\partial F(\pi)}{\partial C} = -\left(\frac{\pi}{\pi^*}\right)^{\beta_1} < 0 \quad (19)$$

$$\frac{\partial F(\pi)}{\partial \theta} = -\lambda \frac{\left(\frac{\pi}{\pi^*}\right)^{\beta_1} \pi^*}{\delta^m} < 0 \quad (20)$$

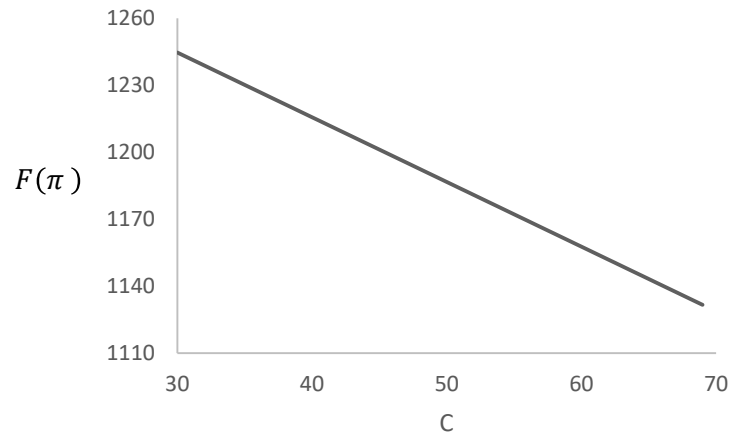


Figure 5: Fixed Costs influence on the IPO Option

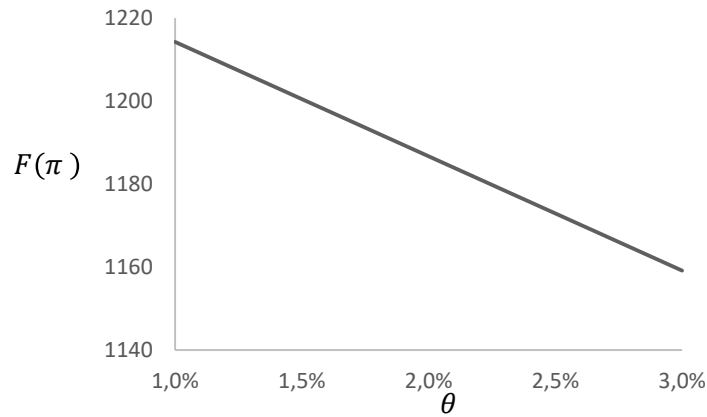


Figure 6: Variable Costs influence on the IPO Option

Concluding this first analysis, both costs implied to the operation have a negative effect on the Value of the IPO Option. This is explained by the nature of the costs, as it extracts value to the deal itself, turning it less attractive as the costs grow.

With this sensitivity analysis being performed for the Value Function of the IPO Option, it is also relevant to add the same analysis to the Critical Value of the model that states whether or not the operation should be induced. The same variables are going to be analysed, apart from the cash flow of the firm, which does not influences the critical value.

$$\frac{\partial \pi^*}{\partial \delta^G} = - \frac{C \beta_1}{\lambda \delta^{G^2} \left(\frac{1-\theta}{\delta^m} - \frac{1}{\delta^G} \right)^2 (\beta_1 - 1)} < 0 \quad (21)$$

$$\frac{\partial \pi^*}{\partial \delta^m} = \frac{C(1-\theta)\beta_1}{\lambda \delta^{m^2} \left(\frac{1-\theta}{\delta^m} - \frac{1}{\delta^G} \right)^2 (\beta_1 - 1)} > 0 \quad (22)$$

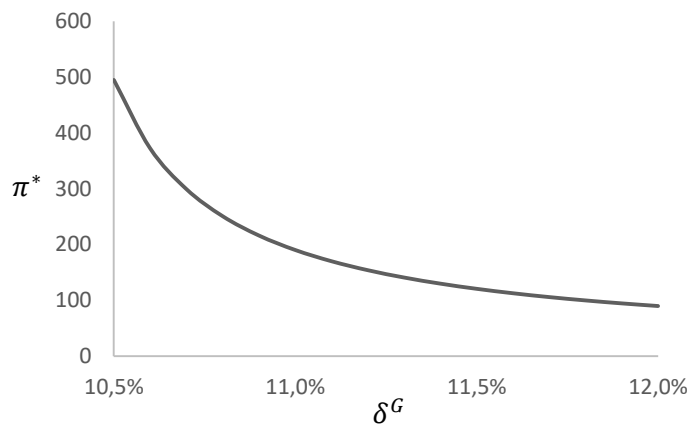


Figure 7: Public dividend yield influence on the Critical Value

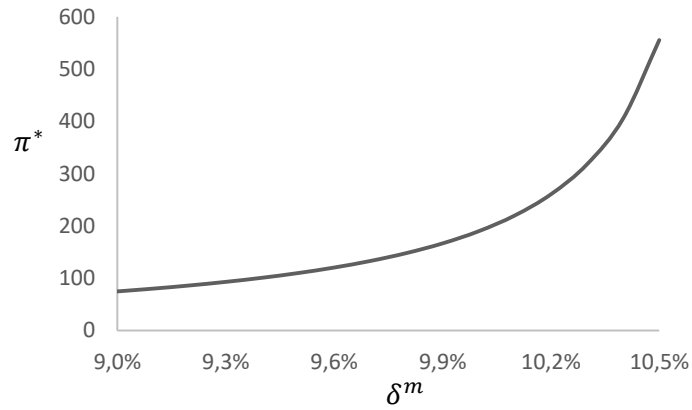


Figure 8: Market dividend yield influence on the Critical Value

Starting with the dividend yields, it can be seen that the effect of each one is again the opposite. While the government dividend yield is now negatively related with the Critical Value, the market dividend yield turn out to be positively related.

$$\frac{\partial \pi^*}{\partial \sigma} = \frac{\partial \pi^*}{\partial \beta_1} \frac{\partial \beta_1}{\partial \sigma}; \frac{\partial \pi^*}{\partial \beta_1} > 0 \quad (23)$$

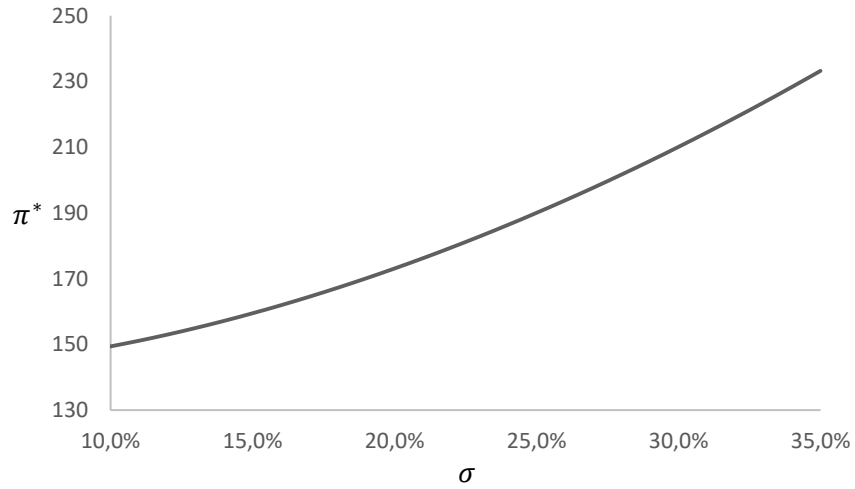


Figure 9: Volatility influence on the Critical Value

Moving now to the volatility, the higher the uncertainty, the higher the Critical Value for the IPO to be operated, just like it happens with the value function.

$$\frac{\partial \pi^*}{\partial C} = \frac{\beta_1}{\lambda \left(\frac{1-\theta}{\delta^m} - \frac{1}{\delta^G} \right) (\beta_1 - 1)} > 0 \quad (24)$$

$$\frac{\partial \pi^*}{\partial \theta} = \frac{C \beta_1}{\lambda \delta^m \left(\frac{1-\theta}{\delta^m} - \frac{1}{\delta^G} \right)^2 (\beta_1 - 1)} > 0 \quad (25)$$

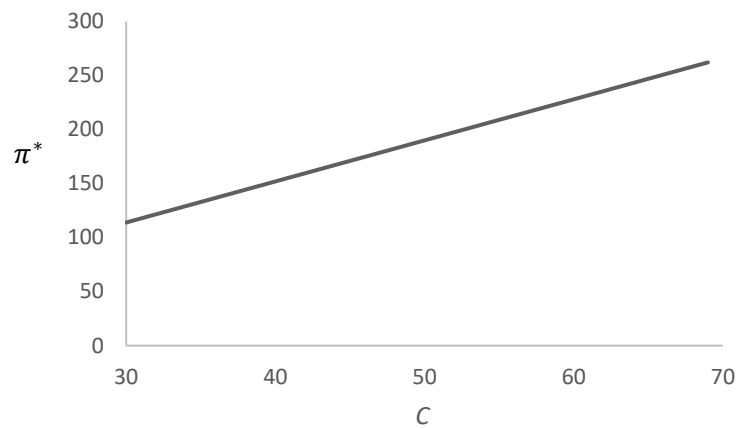


Figure 10: Fixed Costs influence on the Critical Value

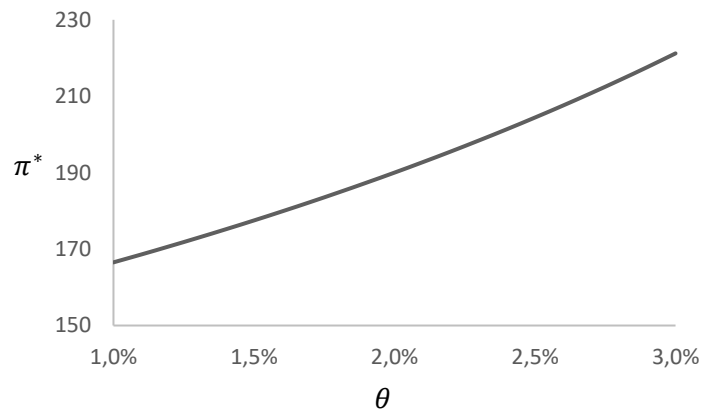


Figure 11: Variable Costs influence on the Critical Value

Just as before, the effect of the costs on the Critical Value end the analysis. Confronting them with the Critical Value, it can be concluded that the costs are positively related with the Critical Value. The higher the costs, the higher price the government would demand for the IPO, in order to compensate what is being lost in the expenses.

Summing up all the analysis executed, all the results and demonstrations are in line with the economic intuition, as it was mandatory to be.

4. Applications

To better present the model developed in Chapter 3, in this chapter the model is going to be applied to real cases, to demonstrate its utility, its effectiveness and the way it can be worked to study a given case. To be as pertinent as it could be, it would be important to find relevant operations, with some impact in their countries, and that were also recent, in order to still have some validity nowadays when studying a given privatization with the model.

The courier and parcels delivery sector have been in recent years one of the most active of the economy in respect to privatizations. Royal Mail, Japan Post, Poste Italiane and CTT, among others, are perfect examples of significant privatizations, involving large debate across its countries regarding the legitimacy of such operation. Royal Mail for its global scale and CTT as the Portuguese example, were the cases selected to apply the model. Also, it was selected two cases of the same economic sector to strengthen the study of one another.

4.1. The Royal Mail case

Royal Mail is a British postal service company with 500 years of history, being the main operator of its sector in the United Kingdom, while as well being positioned as one of the strongest courier companies of the world, position built and developed through its long history. Its operations can be divided in three different areas, the letters market of the United Kingdom, the parcels market of United Kingdom as well and the international parcels delivery, that represents the European parcels market, which Royal Mail explores through a subsidiary, General Logistics Systems, present in 22 countries, or network partners of the named subsidiary which enables Royal Mail to cover 18 more countries.¹

Since the 70s the United Kingdom has a long history and tendency for privatizations. Obviously with some fluctuations, mainly affected by the ideologies of the governments. The history of privatizations and the first wave of privatizations in the United Kingdom is strongly related with the years in the office of Margaret Thatcher as

¹ Royal Mail Annual Report 2012-13.
<<http://www.royalmailgroup.com/sites/default/files/Annual%20Report%20and%20Accounts%202012-2013.pdf>>

Prime Minister. Starting in 1979 and maintaining the focus on privatization across the 80s decade, a large amount of relevant SOEs were privatized, like Britoil, British Petroleum, British Telecom and British Steel Corporation. After these years, the United Kingdom lived two party changes in the Government in place, and the number of privatizations diminished abruptly, remaining at this point just a few core companies as state-owned ones. A new wave of privatizations started in 2009, and with that the debated hypothesis to privatize Royal Mail gained force.

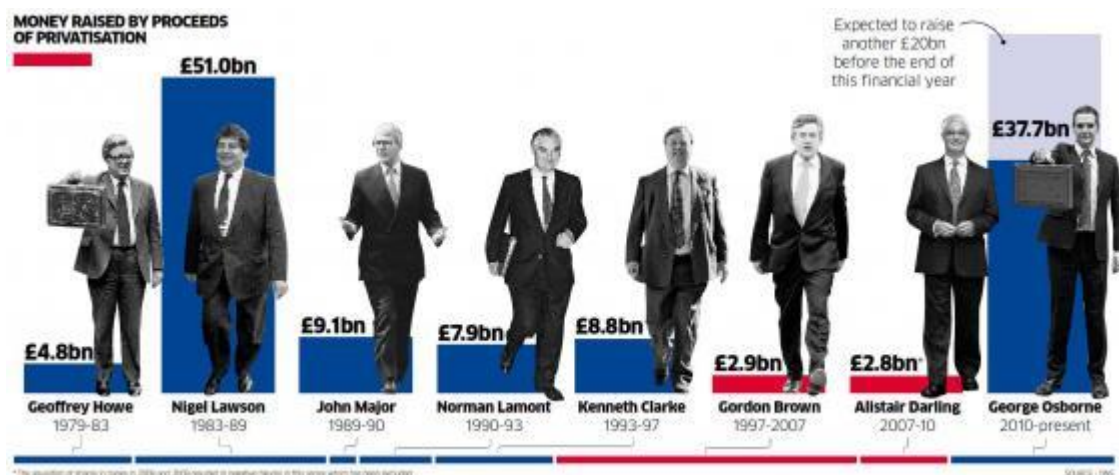


Figure 12: Proceeds of Privatizations by each Chancellor of the Exchequer²

Figure (12) illustrates the money raised in proceeds of privatization, and the discrepancies across mandates and parties in power, being mentioned the related Chancellors of the Exchequer, known in other countries as the Minister of Finance or Secretary of the Treasury. So, the privatization of Royal Mail was affirmed and enabled on the Postal Services Act 2011, where some conditions for the operation were already established, such as the offer of shares to the Royal Mail staff, and it was defined that 90% of Royal Mail would be available for the private investors to acquire.³

The company had demanding goals for the near future, such as improving efficiency, maintain financial flexibility and to meet the evolution of the customers' needs, in order to defend its position on the letters market and to win in the parcels delivery. With that said, the company needed a strong financial support, and the

² "George Osborne on course to privatise more public assets than any Chancellor since 1979". <<http://www.independent.co.uk/news/uk/politics/george-osborne-on-course-to-sell-off-more-public-assets-than-any-chancellor-for-more-than-30-years-a6786926.html>>

³ Postal Services Act 2011.

< http://www.legislation.gov.uk/ukpga/2011/5/pdfs/ukpga_20110005_en.pdf>

government and Royal Mail management stated that the company needed access to private capital in order to grow and compete. They presented and reinforced the growth in internet shopping and the effect that it has on parcel delivery, which became considerably more important to the business than the traditional delivery of letters. However, to meet such demands of the parcels market it was needed relevant investments⁴, and the government was reluctant to invest large sums of money by himself when the goal was to cut public spending and borrowing.

The pre-privatization performance of the company was considerably positive, with gains in revenue and higher EBITDAs from 2011 to 2013. Also it was indicated substantial improvements on parcel revenue from 2013 to 2014 while the business volume remained practically unchanged.

This deal has some particular characteristics, and the privatization of Royal Mail was concluded in three phases. The first one is the relevant for the dissertation, representing obviously the Initial Public Offer that happened in October of 2013. It was defined by the Selling Shareholder to put on the market between 401 and around 522 million shares, representing respectively 40,1 and 52,2%, and the final amount of sold shares were dependent on the demand for them. It was included in the offer for stabilization purposes an over-allotment option, representing 15% of the number of shares available on the market. The offer was divided between a Retail Offer and an Institutional Offer, and it contained also, as referred before, an employee free shares offer of 10% of the company stake. The final summary of the offer, states that all the 52,2% of the shares were sold, being only 17% on the hands of individuals, representing gross proceeds of almost £1722 million. The over-allotment option was exercised and around 78 million shares were added to the offer, putting up a final 60% of the company already sold by the Government, plus the 10% for the employees. Addressing now the costs of the deal, they are divided in several items, which gives respect to the different kinds of costs. The operation had a £21,7 million in fees paid to advisers and underwriting commissions. The Retail Offer and Institutional Offer had a dissimilar burden in fees, being the logistics of the Retail Offer more expensive. After all, the weighted underwriting fee, that gives respect to the £21,7 million in relation to the total proceeds, was around 1,23%. Apart

⁴ “Royal Mail privatisation”.

< http://www.economicsonline.co.uk/Business_economics/Privatisation_of_Royal_Mail.html>

from this, the aggregate expenses incurred by the Company in the Admission and Offer of the IPO were estimated to be approximately £23,4 million, which adds to expenditures in respect to stamp duty in connection with the Offer for the value of £6,8 million. With that said, the administrative costs of the operation ended up to be around £30,2 million.⁵

Although there was concluded by some authors and entities that this privatization was underpriced, it was considered to be a great triumph, being the goals of the operation achieved.⁶ The Business, Innovation, and Skills Committee report and the National Audit Office considered that it was clear that the primary objective was achieved, the sale of shares, it was not clear that the value for money was on point, and apparently the Government could have achieved better value for the taxpayer. IPO specialists considered also that should have been more transparency through the whole process. The remaining 30% of the share capital of Royal Mail that was not sold right on the first phase of privatization was divided in two, equally, and sold in June and October of 2015, generating around £750 million⁷ and £591 million, respectively. It is important to say that the final part were discounted in 2%, that were offered to the employees. The total proceeds of the privatization of Royal Mail reached the value of £3,3 billion.⁸

4.1.1. Data

4.1.1.1. Yields and Growth

For the execution of the models and application of them to real cases, it is mandatory to assume consistent dividend yields and growth rates, as it is not very trustful to focus on the cash flows and market capitalization values of the companies approached in the cases to calculate through ratios the reference dividend yield and growth rate. This is explained not only by the lack of data in just two companies, but as well the possibility for unreal rates due to outlier values, whether it is abnormal highs or lows.

⁵ Royal Mail plc – IPO Prospectus

⁶ “Royal Mail privatisation £180m underpriced, review says.”
<<http://www.bbc.com/news/business-30527392>>

⁷ “Royal Mail stake sale raises £750m for UK government.”
<<https://www.ft.com/content/c9ceb79a-0f88-11e5-94d1-00144feabdc0>>

⁸ “Royal Mail fully privatised for first time in its 500-year history as Government sells off remaining 14% stake.”
<<http://www.thisismoney.co.uk/money/markets/article-3270365/Royal-Mail-fully-privatised-time-500-year-history-Government-divests-final-14-cent-stake.html>>

With that said it is possible to find consistent reference values for the market dividend yield, market growth rate and public growth rate for courier and parcels delivery companies, by using data of other companies that are present in the same market sectors. For the case of the public dividend yield, the case turns out to be different. It is clear that a SOE, by not being publicly traded on the market, does not have a market capitalization value, one of the needed figures, apart from the cash flows, to calculate the dividend yield.

So, to find the needed consistent reference value already mentioned for the public dividend yield, it is necessary to follow the methodology presented in the model development. First are presented the equations to calculate both the public and the market dividend yield:

$$\delta^G = \mu - \alpha^G \quad (26)$$

$$\delta^m = \mu - \alpha^m \quad (27)$$

These equations were originated from the condition that gives α , the trend parameter or growth rate of cash flows, that was presented in the beginning of the model development. Also the public and the market required rate of return were assumed in the mandatory conditions subchapter, so in both equations appears the same rate of return, simply by μ . From the Equation (27) it is straightforward to understand the following condition:

$$\mu = \delta^m + \alpha^m \quad (28)$$

which presents the equation to find the required rate of return, while enabling the Equation (26) to be transformed and to replace the μ by the sum that leads to the required rate of return value, transformation exemplified as follows:

$$\delta^G = \delta^m + \alpha^m - \alpha^G \quad (29)$$

With that simple transformation, it is found the equation that enables the calculation of the dividend yield of the SOE. As it was presented before, the variables needed for the calculation can be figured out by using the data of several companies that fall into the same category. The dividend yield of each year presented in the following tables are calculated by simply dividing the Cash Flows by the Market Capitalization of the same year, performing it for every year and every company. Regarding the Cash Flow growth, the values are given by calculating the logarithmic variation between two years, so the logarithmic division of the Cash Flows of a year divided by the previous year. With

that said, in order to calculate the market dividend yield and market growth rate, Deutsche Post, Fedex, UPS and TNT were selected to serve as reference to Royal Mail and CTT.

Deutsche Post	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014	31 Dec 2015
Market Cap	14 370M €	20 080M €	32 056M €	32 703M €	31 442M €
Cash Flow	3 123M €	2 400M €	3 417M €	2 978M €	3 608M €
Dividend Yield	22%	12%	11%	9%	11%
CF Growth	-	-26%	35%	-14%	19%

Table 1: Deutsche Post dividend yield and CF growth data⁹

Fedex	31 May 2012	31 May 2013	31 May 2014	31 May 2015	31 May 2016
Market Cap	\$ 28 172M	\$ 30 594M	\$ 41 426M	\$ 49 609M	\$ 43 987M
Cash Flow	\$ 2 843M	\$ 4 917M	\$ 2 908M	\$ 3 763M	\$ 3 534M
Dividend Yield	10%	16%	7%	8%	8%
CF Growth	-	55%	-53%	26%	-6%

Table 2: Fedex dividend yield and CF growth data¹⁰

UPS	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014	31 Dec 2015
Market Cap	\$ 70 481 M	\$ 70 264 M	\$ 96 988 M	\$ 100 608 M	\$ 85 259 M
Cash Flow	\$ 3 034 M	\$ 7 327 M	\$ 4 665 M	\$ 2 291 M	\$ 2 730 M
Dividend Yield	4%	10%	5%	2%	3%
CF Growth	-	88%	-45%	-71%	18%

Table 3: UPS dividend yield and CF growth data¹¹

TNT	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014	31 Dec 2015
Market Cap	3 134 M €	4 579 M €	3 678 M €	3 037 M €	4 275 M €
Cash Flow	250 000 M €	401 000 M €	696 000 M €	652 000 M €	464 000 M €
Dividend Yield	8%	9%	19%	21%	11%
CF Growth	-	47%	55%	-7%	-34%

Table 4: TNT dividend yield and CF growth data¹²

In the previous tables are presented the individual data of each company, already with the annual dividend yield and cash flow growth. In the next table, the mean dividend

⁹ Deutsche Post data from Annual Reports. < <http://www.dpdhl.com/>>

¹⁰ Fedex data from Annual Reports. < <http://www.fedex.com/us/>>

¹¹ UPS data from Annual Reports. < <https://www.ups.com/>>

¹² TNT data from Annual Reports. < <https://www.tnt.com/>>

yield and mean CF growth of each company is presented, including the final values for the market dividend yield and growth rate.

	Deut. Post	Fedex	UPS	TNT	Mean
δ^m	11%	10%	5%	14%	9,79%
α^m	3,6%	5,4%	-2,6%	15,5%	5,47%

Table 5: Summary for market dividend yield and market growth rate

It is now missing just one figure to enable the calculation of the public dividend yield, the public growth rate of companies of the courier and parcels delivery market sector. The calculation of the growth rate follows the same methodology as the one presented before. For this study it was selected the actual values of Royal Mail, Poste Italiane and Correos.

Poste Ital.	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Cash Flows	1 093 M €	1 903 M €	2 533 M €	1 445 M €	1 703 M €
CF Growth	-	55%	29%	-56%	16%

Table 6: Poste Italiane CF growth data¹³

Royal Mail	27 Mar. 2011	25 Mar. 2012	31 Mar. 2013
Cash Flows	£ 319 M	£ 473 M	£ 351 M
CF Growth	-	39%	-30%

Table 7: Royal Mail CF growth data¹⁴

Correos	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014
Cash Flows	244 M €	146 M €	145 M €	126 M €	221 M €
CF Growth	-	-51%	-1%	-14%	56%

Table 8: Correos CF growth data¹⁵

Much like it was presented the data of the companies for the market reference values, the previous tables have their individual data about their Cash Flows dispersion and the annual growth. The following table presents the mean growth of each of the three companies, and the weighted (Royal Mail as it has only three years of data have less

¹³ Poste Italiane data from Annual Reports. < <https://www.poste.it/>>

¹⁴ Royal Mail data from Annual Reports. < <http://www.royalmailgroup.com/>>

¹⁵ Correos data from Annual Reports. < <https://www.correos.es/>>

weight on the final value) CF growth of the three companies, representing the public growth rate.

	Poste Ital.	Royal Mail	Correos	Mean
α^G	11%	5%	-2%	4,42%

Table 9: Summary of public growth rate

To summarize all the data gathered and presenting the reference figures to apply in the real numerical cases, revealing also the value for the public dividend yield, it is now presented the following table:

δ^G	δ^m	α^m	α^G
10,84%	9,79%	5,47%	4,42%

Table 10: Summary of reference values

4.1.1.2. Volatility

To determine and present a consistent value for the volatility to serve the case of Royal Mail is the only necessity missing to apply in the model. Thus, being Royal Mail and CTT relatively fresh companies in the traded market and to find a more trustful value for this variable, the aim was to find a trend, or reliable rate, that translates the expected volatility for the letters and parcels delivery market. In order to do that, the companies that were previously used as benchmarks for the market dividend yield and market growth, Deutsche Post, Fedex, UPS and TNT, were also used to find the mentioned reference volatility rate. In the following table is presented the share price volatility of 2013 of each of the companies, and the mean of the four values, that make up the volatility rate used in the cases.

	Fedex	UPS	DP	TNT
Annual Volatility	22,16%	13,70%	18,51%	19,30%
Mean Volatility	18,42%			

Table 11: Summary of Volatility data

4.1.2. Applying the Models

To have all the essential data gathered to apply the models to this real case, apart from what was already presented, there is only missing the risk-free rate of the United Kingdom. For that, it was used the coupon rate of the United Kingdom 10-year Government Bonds on the 15th of October of 2013, the day that marked the first trading day of Royal Mail shares on the market. The correspondent rate to that date was 2,804%¹⁶.

Therefore, it is presented now a summary table of all the inputs to the model.

δ^m	9,79%
δ^G	10,84%
r	2,804%
π (£M)	351 ¹⁷
σ	18,42%
λ	52,2%
C (£M)	30,2
θ	1,23%

Table 12: Summary of data for the Royal Mail case

All the conditions are now assembled to present the outputs of the model, and proceed for the conclusions available from the results.

Output	Description	Value
$F(\pi)$	Value of the IPO Option	£1818,43M
π^*	Critical Value	£80,23M

Table 13: Model outputs and results

First of all, considering that the Profit Flow of the company, £351 million, is higher than the Critical Value, the Option value of the IPO given by the Value Function is the one presented, £1818,43 million. As it can be understood by the values presented of the Profit Flow and Critical Value, the Critical Value is lower than the Profit Flow of the company for the last annual report of Royal Mail, which makes the timing decision to proceed with the operation as the right decision. If it happened the Critical Value to be higher than the Profit Flow, the decision should be to postpone the operation, as the operation would not be respecting the optimal timing decision.

¹⁶ UK 10-Year Bond Yield

< <http://uk.investing.com/rates-bonds/uk-10-year-bond-yield-historical-data>>

¹⁷ Royal Mail Annual Report 2012-13

With privatizations with such high proceeds, and considering also the nature of the IPO, being a privatization one, the charges with the process are expected to be below the average of an IPO deal¹⁸. Moreover, the expenses with the Royal Mail privatization were even lower than the expected ones for such deal, so this helps to justify the difference between the Royal Mail profit flow and the Critical Value.

4.1.3. Sensitivity Analysis

Now, having values of an actual IPO case, a new sensitivity analysis can be done. Thus, much like how it was conducted before, the variables that have a bigger impact on the outputs or the ones that went through a bolder assumption are the ones that are analyzed.

This analysis starts by a distribution of credible outputs resulting on the variation of both the public and the market dividend yield. This approach for a sensitivity analysis not only grant the possibility to assess the impact of each of the two variables, but also the relationship between them and how that results on the output. This analysis was done using the most relevant output, the Critical Value.

Critical	Value	Market Dividend Yield				
	80,23	9%	9,4%	9,79%	10,2%	10,6%
Public Dividend Yield	10%	72,45	139,12	788,33	-	-
	10,4%	51,50	78,47	147,62	1030,16	-
	10,84%	39,66	54,10	80,23	151,28	743,57
	11,2%	33,70	43,67	59,39	91,35	177,08
	11,6%	29,10	36,30	46,63	64,45	98,23

Table 14: Sensitivity analysis of Public and Market dividend yield

This table clearly shows what was already presented, that for the case where the market dividend yield is higher that the public one, there is no pertinent value to the critical value. Also, it shows that the closer the rates are, the higher the Critical Value is, and the opposite is manifested as well, the higher the difference between the public and the market dividend yield, the lower is the critical value.

¹⁸ “Banks get slim fees for privatisation of Royal Mail”.
< <http://uk.reuters.com/article/uk-royalmail-ipo-banks-idUKBRE98Q0V620130927>>

r	π^*	σ	π^*	C	π^*	θ	π^*
2,0%	79,28	10%	70,97	15	39,85	0,80%	76,35
2,4%	79,74	15%	75,88	25	66,42	1,00%	78,11
2,804%	80,23	18,42%	80,23	30,2	80,23	1,23%	80,23
3,2%	80,74	20%	82,50	35	92,98	2,00%	88,26
3,6%	81,29	25%	90,71	45	119,55	3,00%	101,44

Table 15: Sensitivity analysis of key variables

In the last table it is presented the rest of the analysis made. The results are in line with the analytical sensitivity analysis, so all these variables presented have a positive effect on the Critical Value, the higher each of the variable, the higher the Critical Value turns out to be. The administrative costs can be considered the variable that have a stronger impact in the output, strengthening what was presented earlier, that the low expenses with the operation led to a relatively low Critical Value when compared to the company profit flow. On the other hand, the risk-free rate have an almost null effect on the output result.

4.2. The CTT case

CTT – Correios de Portugal is a Portuguese company that, just like Royal Mail, is essentially focused on the postal service business. Its roots date back to the year of 1520. Until very recently it was a SOE, owned by the Government during the majority of its life, apart some decades of the 20th century, but being definitely incorporated by the Government in 1969. CTT always managed to have a severe dominance in the letters market in Portugal, having as well nowadays a very considerable share, around 35%, of the express mail and parcels delivery Portuguese market, being also present in Spain and Mozambique in this business area¹⁹.

The history of privatizations in Portugal, like the one of the United Kingdom, is characterized by several phases that are marked and defined by the Governments and the macroeconomic environment lived in the country. A fundamental introduction to the Portuguese privatization process during the late decades of the twentieth century and current century, was the nationalization program after the April 25th Revolution, that imposed the end of the dictatorial regime. Starting in 1975 the financial sector and Portuguese industry were the main sectors of economic activity that were covered by this plan. From the end of the dictatorship until the end of the 80's decade, there were some constitutional and legislation reviews concerning the extent of the State ownership in companies of various sectors of activity and the breach for SOEs to being privatized. So, from 1989 to 1996 happened the first wave of privatizations in Portugal. It resulted in around 5 billion euros gathered by the Portuguese State, mainly through the privatization of companies of the financial, manufacturing and insurance sector, and it also triggered the Foreign Direct Investment in Portugal. From 1996 Portugal entered in a phase of stabilization with the SOE's and possible plans to privatize new ones, however there were some relevant companies that were partially sold to the public or private investors, as it is exemplified by the Portugal Telecom in 1995 and EDP in 1997. The second wave of privatizations surged when the European Union forced the Government to apply some measures to revitalize and protect the Portuguese economy. As a result of that, numerous companies were privatized from 2011 to these days, and several more initiated the process

¹⁹ CTT Annual Report 2013

< https://www.ctt.pt/contentAsset/raw-data/628e2041-ecd4-42a8-aadc-c949569dde69/ficheiro/0b759e7f-aa9a-4dd4-a8d3-e73e759aac8d/export/Relatorio_e_Contas_2013.pdf>

to being sold to the public and private investors or at least were considered to be privatized. CTT was one of the companies that made this group, EDP and Portugal Telecom ended the process of fully privatization, and Galp and REN were two more companies transferred from the hands of the Portuguese State to private owners.

With that presented, it is now clear that the motivation for the privatization of Royal Mail and CTT was partially, but significantly, different. If the British Government proceeded with the privatization of Royal Mail because of its necessity to collect more funds and produce considerable investments to remain competitive, the privatization of CTT was more a question of necessity of the Portuguese public accounts, to control the public debt of the country.

Although the necessity for large investments is not stated as mandatory for the prosecution and development of CTT businesses, and with the stable position reached by the company throughout its markets and not being present in a lot of countries and business sectors, CTT have some audacious goals for the near future. While their sectors of operation are being characterized by the growth on E-commerce, focus in efficiency and diversification of services, CTT aims to follow these tendencies by appropriating the full potential of its assets, take on the growth of the parcels delivery market, penetrate in the financial sector, through the creation of Banco CTT and preserving the value of the courier business. For the prosecution of these goals CTT relies and believes in four competitive advantages that the company can take on, the financial stability, distribution and proximity of its distribution centers and shops, operational excellence and appreciation for the human capital.

Exploring the performance of the company before the IPO, there were a decrease in revenues, but it was more than compensated with the reduction in costs, explained by the improved efficiency presented before, which resulted in an increase in the EBITDA. Also, according to a 2013 Banco BiG report, CTT presented one of the best EBITDA margins in the traditional letters market in comparison with the strongest European courier companies, somewhere around 15% in the years that preceded the IPO. However, it is important to present that the report brought up the negative trend on the letters market volume across Europe, trend to which Portugal is no exception²⁰.

²⁰ “Oferta Pública de Venda CTT”.

<<https://www.big.pt/pdf/An%C3%A1lises%20BiG/PSI20%20Notes/CTT/CTT%20-%20OPV%20Update.pdf>>

Much like the case of Royal Mail, the privatization of CTT had two phases and some particular characteristics in each of them, especially the first phase, which is the one to be studied and presented, containing the mandatory IPO to be relevant for the dissertation. The Portuguese Government decided to put on the market 105 million shares, in December of 2013, representing 70% of the share capital of CTT. There was defined an interval of prices to which the shares could be sold [4,10€ to 5,52€], being the final price of each share to be decided just before the start of the selling, after scrutinizing the demand for the shares and the most appropriate price for the future of the company. With that said, the price for the share were tagged at the top end of the interval, 5,52€. Similar to the Royal Mail operation, the Offering was divided in two segments, a Retail Offer and an Institutional Offer. The Retail Offer were composed by 21 million shares, 14% of the total share capital, and it also comprised 5,25 million shares, a quarter of the Retail offer, available to the company employees, being them “graced” with a 5% discount on the price. The rest of the shares, 84 million representing 56% of total share capital, were allocated to the Institutional Offer, to financial institutions with the obligation to disperse them through national and international market. The Institutional Offer contained a stabilization mechanism, a Greenshoe Option, to regulate the offer and demand and the price in the market. There were almost 10 million share in this option, and basically being the shares sold, the Government had a Call Option on this amount of shares, and after it the entitled underwriter to be the stabilization manager gained a Put Option to buy back the shares, all of this within specific and previously defined dates²¹. The final proceeds of this operation turned out to be around 579 million euros²².

Concerning the costs of the deal, the Prospectus of the IPO of CTT refers two different types of costs. Firstly, it is mentioned that the Selling Shareholder predicted to pay the Underwriters and other financial institutions that supported the operation, a maximum fee of 4,9€ million. This maximum fee is linked with the interval of prices presented above, and being the price fixed at 5,52€, the maximum available, the commission inherent to the underwriters is as well expected as higher as it could be, in

²¹ CTT – IPO Prospectus

<http://www.ctt.pt/contentAsset/raw-data/86fa5494-2a9f-44fe-82dd-3b21ecbd2330/ficheiro/10a91668-44eb-49ae-b9ed-90cf6935de7a/export/Prospecto_CTT.PDF>

²² “Estado vende CTT ao preço máximo nos 5,52 euros por acção”.

<http://www.jornaldenegocios.pt/mercados/bolsa/opv_dos_ctt/detalhe/estado_vende_accoes_dos_ctt_nos_552_euros_por_acciao_para_publico_em_geral.html>

that case, 4,9 million euros. That gives a final 0,85% of underwriting fee for the deal. Then the Prospectus states that the Selling Shareholder have as well around 4€ million in expenses in general expenses as regards to the operation.

The second phase of the full privatization of CTT was concluded in September of 2014, collecting proceeds of 343€ million for the remaining of share capital that was still held by the Government²³, totalizing 922€ million with the privatization of CTT and without subtracting the usual costs. Even though the privatization of CTT were contested by analysts and political parties in the opposition, the whole process was considered as a success by Parública (the entity responsible to manage the public participations of SOEs and partly-privatized companies), the Ministry of Economy in power and the CEO of CTT. Besides that, some analysts considered that the potential gains of the operation were affected by fixing the price of a share at the top end of the interval, and it was anticipated that the Government would not do that and had stood for a more cautious approach.

4.2.1. Applying the Models

Just like the Royal Mail case decomposition and presentation in the dissertation, there is only missing the risk-free rate for the complete collection of the data to the application of the models. The assumption were the same made previously, so it was selected for it the rate at what the Portuguese 10-year Government Bond on the day of the IPO launch on the market, the December 5th of 2013, where the Bonds were offering a 6,014% coupon rate²⁴.

δ^m	9,79%
δ^G	10,84%
r	6,014%
π (€M)	544,88 ²⁵
σ	18,42%
λ	70%
C (€M)	4
θ	0,85%

Table 16: Summary of data for the CTT case

²³ “Venda dos CTT já foi concluída. Governo encaixa 343 milhões de euros”.

<http://www.jornaldenegocios.pt/empresas/detalhe/venda_dos_ctt_ja_foi_concluida_governo_encaixa_343_milhoes_de_euros.html>

²⁴ Rendimento do Título Portugal a 10 anos

<<http://pt.investing.com/rates-bonds/portugal-10-year-bond-yield>>

²⁵ CTT Annual Report 2013

Following the sequence already used, here it was presented the table of all the inputs. Only the final results of the outputs are now left to be presented:

Output	Description	Value
$F(\pi)$	Value of the IPO Option	€3859,09M
π^*	Critical Value	€8,07M

Table 17: Model outputs and results

The output values for the CTT case are a lot more extreme than the ones of Royal Mail. The CTT IPO achieved an even lower underwriting fee and inferior general costs with the operation, and at the end of the year of the IPO, although Royal Mail have a considerably different dimension than the one of CTT, the Cash and cash equivalents of CTT were higher than the ones of Royal Mail, and when compared to the total proceeds of the two operations, the case of CTT gets more extreme.

With that said, the value of the IPO Option for the case where the Critical Value is lower than the Profit or Cash Flow, is €3859,09 million, being naturally considered a tremendously high value. The Critical Value is just €8,07 million, massively below the Profit Flow, 544,88€ million, so the timing decision of the IPO Option were to proceed with the operation, just like it happened. Once again, if the Critical Value were higher than the Profit Flow of that year, the timing decision would be different, and the optimal decision would be to postpone the deal.

4.2.2. Sensitivity Analysis

The methodology of this sensitivity analysis is the same of the one used to the Royal Mail case. So, the same work done with the two dividend yields was also employed for the CTT case, and later the individual analysis of each of the relevant variables are presented as well.

Critical	Value	Market Dividend Yield				
	8,07	9%	9,4%	9,79%	10,2%	10,6%
Public Dividend Yield	10%	7,38	13,69	58,45	-	-
	10,4%	5,28	7,93	14,42	70,33	-
	10,84%	4,07	5,51	8,07	14,71	56,48
	11,2%	3,46	4,46	6,02	9,12	16,98
	11,6%	2,98	3,71	4,74	6,49	9,74

Table 18: Sensitivity analysis of Public and Market dividend yield

It is straightforward to achieve the same conclusions as before, which only reinforces the findings of the previous case. Concerning the rest of the variables, here it is presented the analysis:

σ	π^*	C	π^*	θ	π^*
10%	6,91	2	4,04	0,60%	7,85
15%	7,55	4	8,07	0,85%	8,07
18,42%	8,07	6	12,11	1,00%	8,21
20%	8,34	10	20,18	1,50%	8,71
25%	9,26	20	40,36	2,00%	9,28

Table 19: Sensitivity analysis of key variables

Once again, apart the risk-free rate analysis that was only conducted on the Royal Mail case as it has few significance, the same variables are tested here, and the conclusions are the same, being all of them positively related with the corresponding outputs and being the administrative or general costs the variable that affects more the final result of the outcome.

5. Conclusions and Findings

For this dissertation it was aimed to develop a methodology that enabled the valuation of an IPO in the context of a privatization. The assessment and valuation of an IPO is definitely a complex task, even though when it is the case of a SOE, operating under the government scope and being affected to the public company environment and characteristics that are linked with it. This complexity comes not only by the status change of the company that influence its performance, turning from a company that is State-owned to be in private hands, and having also its shares traded on the market instead of being possessed by an entity or particulars, but it also comes from the range of variables that impacts the valuation of the operation, and all the uncertainty concerning all dimensions of the deal.

The methodology development followed several steps, from the definition of how the Profit Flow behaves, using a gBm approach, to the ODE that the Value Function for the Option of the IPO must satisfy, the exposition of boundary conditions to the general solution for the ODE, until reaching the final outputs of the methodology, the IPO Option value formula and the Critical Value for the timing decision. The application of the model on the Royal Mail and CTT cases and the results provided supported the decision to privatize the companies on that moment, being the timing decision provided by the model to proceed with the IPOs. Concerning the conclusions of the applications, apart the correct timing decision in either case, just like it was already stated in articles, an IPO of a SOE with a significant scale possesses characteristics that enables the practice of minimal costs, which, adding to other characteristics of this kind of deals, clearly facilitates the timing decision for these cases, having the costs a significant impact on the Critical Value of the deal.

With the results formulated in each of the real cases, it can be concluded how different the intuition brought by this methodology is from the basic valuation of the company and confronting it with the potential proceeds of the deal. These results also help to demonstrate how easy and acceptable the process could be. Perhaps, the privatization policies across the world, could be more effective if the Governments, with a considerable regularity, pursued and investigated the optimal timing to privatize their owned companies - in order to not only seek the most profitable moment to privatize and

the most beneficial timing for a company to change to the hands of particulars or the public - instead of just deciding for the privatization of their SOEs when the Government understands the need for extraordinary funds. This methodology helps to support this mentality as, although it is not a model that indicates a specific moment in time to when the company can and should be privatized, it assists with the valuation of the deal with the current data of variables or expected ones, and deducing also if the deal should be pursued right away or executed when the conditions are more favorable than the ones available.

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