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Franchise ownership redirection: real options perspective

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Abstract

Background: For over 40 years, the franchise ownership redirection hypothesis has attracted the attention of many scholars. This study, differing from previous ones, proposes an alternative approach for this hypothesis using a real options framework with the extension of agency theory.

Method: The real options model is built using the least square Monte Carlo method, where the franchisor's decision to franchise is perceived as a deferred investment while maintaining the right of future acquisition.

Result: Tested using monte carlo simulation based hypothetical case, the model shows a different result from classical real options call model. This is mainly due to franchise contractual arrangement, where royalty fee lower the threshold of acquisition cost in converting the franchise outlet to company owned.

Conclusion: The aim of this study is to create an analytical framework that helps a franchisor decide whether or not toacquire and convert a franchise unit to a company-owned unit at a certain point in time, analyzing the choice as a deferment of investment. The franchisors that faces the opportunity to optimize profit by converting the franchise unit to a company-owned unit should acknowledge it as real options thus negotiate the terms with their franchisees.

Keywords: Real options, Franchise, Agency theory, Monte Carlo simulation

JEL classification: G130, G17

Background

Ownership redirection, an intriguing theory originally proposed by Oxenfeldt and Kelly (1969), has attracted the interest of many researchers over the 40 years since their study. Building on the concept of resource scarcity, this theory argues that as an organization matures, the franchisor, as part of a strategic plan, will reacquire a franchised unit, converting it to a company-owned unit (Dant & Kaufmann, 2003). This reacquisition has been shown to worry the franchisees, as their businesses could be selfishly taken over by the franchisor, especially if they are performing well (Windsperger & Dant, 2006).

Yet, acquiring a successful franchise unit and converting it to a company-owned unit is not an easy task. Law protects the franchisees and unless they breach the contract, it is difficult to acquire a profitable franchised business unit without resistance. However, it would be different if the franchisor negotiated such terms of acquisition within the contract negotiation process, as the franchisor could include a real options clause in the franchise contract (Gorovaia & Windsperger, 2013). This legal clause could regulate the rights to acquire as well as the price of the acquisition (Kogut, 1991). The franchisor could then exercise the option to acquire the unit at a later date when conditions are favorable to do so.

This study, differing from previous ones, proposes an alternative approach for the ownership redirection hypothesis using a real options framework. Specifically, this study's contribution is its distinct outlook using a real options framework where the franchise unit is seen as an investment deferment. Using this deferment, aligned with ownership redirection theory, the franchise is chosen as a method of early expansion with the possible acquisition by the franchisor if the uncertainty of the business has been unfolded.

The Bermudan options are used as real options that are valued as an extension of the least square Monte Carlo (LSM) method, as proposed by Longstaff and Schwartz (2001). In the options valuation point of view, the LSM method is the appropriate real options model for franchise decisions due to its capability to value options with early exercise features such as American and Bermudan options. Moreover, as a simulation based valuation, LSM method can price path-dependent stochastic processes and multiple underlying assets, which are also modeled in this study.

The aim of this study is to create an analytical framework around the franchisor's decision to acquire and convert a franchise unit into a company-owned unit. Additionally, as the model includes agency theory, it aims to illustrate the impact of real options, and thus, the decision of the franchisor to acquire the unit. The value of the real options approach highlights the importance for the franchisor of keeping his/her options open as well as the maximum negotiable value for the terms of the acquisition.

This paper is organized as follows: the next section is a short review of ownership redirection and real options theory. In the third section, the model is constructed, and then tested using hypothetical examples. The final section provides the conclusion.

Literature review

Ownership redirection in a franchise

Building on resource scarcity theory, Oxenfeldt and Kelly (1969) first coined the term ownership redirection theory. This theory conjectures that the franchise is treated as an instrument to overcome the constraints of resources (financial, human, and information) in the beginning of a company's operations, but franchisors will convert the franchise units to company-owned units as the franchise units become more mature to take full control of them (Norton, 1988; Windsperger & Dant, 2006). Thus, this theory suggests that the franchisor's portfolio in early stages will be dominated by the franchises, and gradually shift to company-owned units.

However, using agency theory, Rubin (1978) challenged this conjecture. He suggested that the decision to franchise was a means to reduce principal-agent problems inherent in the organization. Therefore, franchising, which promotes residual claimancy, was chosen to save the agency costs that would be more expensive in the company-owned organizational model. These agency costs could come in several forms. For instance, Martin (1988) and Brickley and Dark (1987) focus on costly monitoring in remote geographical areas. In those places, the franchise form is preferable due to employees in company-owned units having a higher tendency to shirk their duties. The authors also point to the incentive based structure of the franchise form, namely, royalties and franchise fees, which are also a key reason why agency costs in the franchise form are cheaper compared to more rigid salary structures generally applied in company-owned units.

Several empirical research studies support Oxenfeldt and Kelly's argument that franchises exist due to a lack of certain company resources, for instance, (Norton, 1988) managerial talent (Caves & Murphy, 1976), capital, and information (Minkler, 1990). However, another stream of research (Bradach, 1997; Lafontaine & Kaufmann, 1994; Sorenson & Sørensen, 2001) offers the alternative perspective that the period of coexistence between a company-owned unit and a franchise is not a transitory period before becoming one entity but rather a stable relationship that the organization could maintain over the long term.

Real options perspective of the franchise

Derived from financial options, the real options theory developed by Myers (1977) has received wide-spread attention. Unlike common financial options, "real" refers to its application to real business decisions rather than to stock as the underlying object. Hence, real options provide the options holder with managerial flexibility, where risk coming from future uncertainty in areas such as customer demand, technology, and cost could be mitigated smoothly (Kogut, 1991). The real options reveal the strategic value behind irreversible investments under uncertainty, which fail to be assessed using the net present value (NPV) method.

Even though real-options based research is already applied in many organizational studies on topics such as joint ventures (Chi & McGuire, 1996; Kogut, 1991) and venture capital investments (Bergemann & Hege, 1998; Casamatta, 2003; Repullo & Suarez, 2004), few franchise studies capitalize on real options as their modeling framework. Among the few researchers that use real options, Gorovaia and Windsperger (2013) conducted empirical research on franchise performance using a resourced-based, real options view, and Nugroho (2015) modeled franchise revenue guarantee using put type options. Lee (2010) also constructed a real options model to evaluate the franchisee's decision to open a franchise. This current study is closest to the latter. The difference between the two is that the research by Lee uses a continuous model based on geometric Brownian motion (GBM), with the real options model from the perspective of a franchisee, whereas this study uses a discrete model from the franchisor point of view.

Method

General model and assumptions

The situation of this study is that of a franchisor who operates a business format franchise needs to decide whether to enter a new market with one of two organizational forms: either to expand through a franchise unit (run by the franchisee) or invest as a company-owned unit (run by an employee). At time zero, aligned with ownership redirection theory conjecture, it is assumed that the franchisor chooses to enter the market through a franchise unit to start, but leaves the option to acquire the unit in the future by buying a real option to acquire the unit. The franchisor has the right (not the obligation) to execute the option within the expiration time [0, T], which is divided into N intervals so that $\Delta t = \frac{T}{N}$.

The difference in the choice of organizational form depends on how the franchisor extracts profit. Due to residual claimancy, it is assumed that the agency costs only exist when the franchisor operates the unit as company-owned. The franchisee has more motivation than a company-owned unit manager as the franchisee will receive the residual profit generated by the franchise establishment. However, in the company-owned mode, the franchisor can extract all the recurring operating profit compared to partial revenue (in the form of royalty fee) in the franchise arrangement. The franchisor total profit is formulated as:

$$\mathrm{P}(\tau, X, A) = \sum_{t=1}^{\tau} \delta X_t + \sum_{t=\tau+1}^{T} X_t(1-c) - A_t \tag{1}$$

Where *P(·)* is the franchisor's total profit, which includes all profits before the franchise acquisition (franchise mode) and after the unit is converted to company-owned. The time τ, indicates the time the franchisor converts the unit. In the franchise organizational form, the franchisor only gains profits from royalty fees, δ, which are calculated as a percentage of stochastic revenue, X. Whereas in the company-owned mode, the franchisor gains profits after considering operational costs, c, and agency costs, A, of running the unit as company-owned. The operational cost (c) that incur during the company-owned mode is considered to be constant, meaning there is no difference in the operational cost when the unit is run by either the franchisee or the employee in the company-owned unit. Whereas the agency costs (A) is assumed to be impacted by many factors, so it considered as stochastic. In this study, the following assumptions have also been made:

- There is usually an initial upfront franchise fee that the franchisor charges the franchisee per period of contract for running a franchise unit, but without loss of generality, it is assumed to be zero.
- The period that was modeled in the study only refers to the period before the options mature. Whereas, after the options expire, the possibility that the franchisor will acquire the franchise unit becomes very small due to difficulties in renegotiating the acquisition price (K).
- The decision to convert is irreversible. Once it is made, the franchisor is locked into the costs and profits associated with ownership of the unit. This assumption is very important in order to assess the franchise acquisition in the real options model.

Stochastic process

Every real options model relies on the design of a stochastic process, as the value of the underlying assets will depend on this. In this study, two underlying assets are considered: revenue (X) and agency costs (A). In implementing options pricing using the LSM method, it is important to use a discrete, stochastic process. While most financial options use the GBM, in this study, the stochastic process of the franchisor's profit is assumed to follow a log-discrete time diffusion (Log DD) model (Kariya & Liu, 2002). The Log DD model considers the stochastic process as a discrete model, which is also needed in the real options valuation using the LSM method and the Log DD model, as shown below.

$$X_t = X_{t-1} exp\left[\mu_{X_{t-1}} h + \sigma_{X_{t-1}} \sqrt{h} \varepsilon_n\right] \quad \varepsilon_n \sim iid \tag{2}$$

Where $\mu_{X_{t-1}}$ is the drift function and $\sigma_{X_{t-1}}$ is the volatility. $\mu_{X_{t-1}}$ and $\sigma_{X_{t-1}}$ can be setup as time varying factor dependent on $X_{t-1} = (X_{t-2}, X_{t-3}, \ldots, X_1, X_0)$, which in this study will be assumed to be constant for simplicity, so that:

$$X_t = X_{t-1} exp[\mu + \sigma \varepsilon_n] \quad \varepsilon_n \sim iid \tag{3}$$

The stochastic model of the agency costs is the same as in Eqs. (2) and (3) after replacing X with A. This stochastic process is similar to that in the Kariya et al. (2005) model in valuing a lease agreement in commercial real estate in Japan and to Nugroho (2015) in valuing a franchise revenue guarantee. The difference with the current study is that both studies assumed the stochastic process as path dependent by modeling the drift using an exponential smoothing model.

Real options model

At time zero, neither the franchisor nor the franchisee knows the future of the business. It is assumed that as time progresses, the value of revenue and agency costs will continuously fluctuate in a stochastic manner. Thus, a real options model will be developed to capture the value of the rights to acquire the franchise based on future uncertainty that impacted by stochastic movement. In this study, the real options framework developed by Longstaff and Schwartz (2001) is used because it can value early exercise options such as American and Bermudan options. Additionally, as a simulation based valuation, this method can easily handle more than one stochastic structure, which is important in this model. Unlike financial options valuation, where every state of time reflects the state of the price, in this study, the movement of revenue (*X*) accumulates in every *t*. The real options value (ROV) of the franchise acquisition is:

$$F(t, X_t, A_t) = \underbrace{max}_{\tau \in \mathbb{T}(t,T)} E^* \left[\left(P(t, X_t, A_t) - K \right) e^{-r(\tau - t)} \right] \tag{4}$$

Where $F(\cdot)$ is the real options value, E^* is the expectation under risk neutrality, and t is the restricted stopping time $\{t_0 = 0,\ t_1 = \Delta t,\ \dots,\ t\ =\ N\Delta t\}$. $P(\cdot)$ is the franchisor's total profit as described in Eq. (1), and K is the cost of acquisition or the amount that needs to be paid as an acquisition cost to the franchisee. Hence, the payoff that the franchisor receives is total operating profit at that point in time less the acquisition cost.

The unique aspect of the real options model in this franchise acquisition case compared to common investments under uncertainty is how the franchisor extracts profit. Profit is not only incurred after the acquisition but also before the acquisition in the form of royalty fee. Combining Eqs. (1) and (4) results in:

$$F(\tau, X_t, A_t) = E^* \left[\underbrace{max}_{\tau} \left(\sum\nolimits_{t=1}^{\tau} \delta X_t + \sum\nolimits_{t=\tau+1}^{T} [X_t(1-c) - A_t] - K, 0 \right) e^{-\tau} \right] \tag{5}$$

From another perspective, all the franchisor's income (royalty fee) during the franchise period will reduce the cost of acquisition. Thus, the franchisor's decision when to convert the unit to company-owned not only considers income after the acquisition, but also the amount the acquisition cost is reduced if the franchisor postpones it.

The key issue also to be handled in this real options formulation is the optimal time to convert the franchise to a company-owned unit, denoted by τ. In valuing options with early exercise features, time (τ) will be referred as the optimal stopping time, which is the main difference in European options that can only be exercised at maturity date. The LSM method was adopted to identify the τ through backward dynamic programming using Monte Carlo simulations. For each path of simulation, it denotes with a superscript $^{(i)}$ so that $P_{t_n^{(i)}}$ is the profit function in the (i th) path and time (t). The equation for the optimal stopping problem in this case is:

$$F(t_n, P_{t_n}) = max\{\Pi(t_n, P_{t_n}), \Phi(t_n, P_{t_n})\} \tag{6}$$

With

$$\Pi(t_n, P_{t_n}) = P(\tau, X_t, A_t) - K \tag{7}$$

and

$$\Phi(t_n, P_{t_n}) = e^{-r(t_{n+1}-t_n)} E^*_{t_n}\left[F\left(t_{n+1}, P_{t_{n+1}}\right)\right] \tag{8}$$

The Eq. (6) above is basically the Bellman equation of finding optimal stopping time by comparing continuation value, $\Phi(t_n, P_{t_n})$, and $\Pi(t_n, P_{t_n})$ so that:

$$\text{if } \Phi(t_n, X_{t_n}) \leq \Pi(t_n, X_{t_n}) \text{ then } \tau^{(i)} = t_n \tag{9}$$

The optimal stopping time will be found by completing Eq. (9) recursively. After the optimal stopping time is updated, the ROV is averaged for all paths:

$$ROV = F(0, x) = \frac{1}{M}\sum_{i=1}^{M} e^{-r\tau^{(i)}} \Pi\left(\tau^{(i)}, P^{(i)}_{\tau^{(i)}}\right) \tag{10}$$

From Eq. (10), the problem boils down to how to find the continuation value (Φ) in order to apply Eq. (9). The LSM method contributes by approximating the continuation value (Φ) that is the conditional expectation of time (t) (if exercise is still allowed) of future optimal payoffs from the contingent claim. As discussed in Gamba, (2003) and Longstaff and Schwartz (2001), Φ is an element of a vector space, which can be represented as:

$$\Phi(t_n, P_{t_n}) = \sum_{j=1}^{\infty} \varphi_j(t) L_j(t, P_t) \tag{11}$$

With respect to the basis of {Lj}. If only J < ∞ are elements of the basis that can be used to approximate Φ, the continuation value becomes:

$$\Phi^J(t_n, P_{t_n}) = \sum_{j=0}^{M} \varphi_j(t) L_j(t, P_t) \tag{12}$$

Then, φj (t) can be estimated by least square regression of Φ(t, Pt) on the basis that:

$$\{\widehat{\Phi}^J(t_n)\}_{j=1}^{J} = arg \underbrace{min}_{\{\varphi_j\}_{j=1}^{J}} \left\| \sum_{j=1}^{J} \varphi_j(t_n) L_j(t_n, P_{t_n}) - \sum_{i=n+1}^{N} e^{-r(t_i-t_n)} \Pi(t, t_i, \tau) \right\| \tag{13}$$

Thus, the continuation value is:

$$\widehat{\Phi}^J(t_n, P_{t_n}) = \sum_{j=1}^{J} \hat{\varphi}_j(t_n) L_j(t_n, P_{t_n}) \tag{14}$$

Equation (14) above is used in the comparison rule in Eq. (9), which is calculated backward from T to t = 1.

Hypothetical simulation

Base case

In this section, the real options model derived in the previous section is tested using a hypothetical franchise acquisition case. The goal is to determine the ROV of franchisor's rights to convert franchise unit to company owned. The base case is summed up in Table 1.

As most of the values are randomly chosen, only the values for revenue at time zero (*X0*), operational costs (*c*) and agency costs at time zero (*A0*) are specifically chosen as 1 MU, 0.85 MU, and 0.15 MU, respectively. Given these values, if revenue and agency costs are constant, the profit of running a franchise as company-owned will return to zero. This means the franchisor would never consider converting the unit to company-owned and instead enjoy the profit from the franchise royalties for an indefinite time. Thus, the impact of the uncertainty of revenue and agency costs will create the value of the real options.

Result and discussion

The hypothetical case presented in the previous sub-section produces unique implications for franchisor decision making in converting franchise units to company-owned. In order to gain a better understanding of the impact of the parameters involved in the ROV, this sub-section will carry out a comparative static analysis to see how the parameter values (with others parameters held constant) affect the ROV.

In addition to the ROV, the average exercise time (AET) is also calculated from each simulated path. Although the AET concept is similar to optimal exercise time (τ), note that the calculation does not represent τ, as Bermudan options can only be exercised in a certain discrete time period before expiration at *T*. However, the AET could be a good approximation of the franchisor deferment of exercising the real options. Thus, it will be interesting to see how the AET value is impacted as the parameter changes.

Moreover, the condition where the royalty fee is flat is also tested. This kind of royalty fee is found mostly in Australian franchises (Frazer, 1998). In this study, it is modelled as the percentage of revenue at time zero, *X0,* to every *tn*. This royalty fee is

Table 1 Base case for hypothetical simulation

Parameter	Notation	Value
Revenue at t = 0	X_0	1 MU (monetary unit)
Revenue initial drift	$\mu_0 X$	0
Revenue volatility	σX	9 %
Agency costs at t = 0	A_0	0.15 MU (monetary unit)
Agency costs initial drift	$\mu_0 A$	0
Agency costs volatility	σA	7 %
Contract period	T	10 years
Time interval	Δt	1 year
Operational cost	c	0.85 MU (monetary unit)
Royalty fee	δ	10 %
Discount rate	d	6 %
Cost of acquisition	K	1

addressed as a flat royalty fee (FRF) case, while the normal royalty fee, defined in the model previously, is defined as a percentage royalty fee (PRF) case. In the FRF setting, the model is more similar to classic real options models, while the uncertainty of the underlying assets only affects the model after acquisition.

Table 2 is a complete comparative statics analysis of the base case conducted to assess the changes in the ROV and AET. Limiting our focus to discuss several parameters, parameters like K (cost of acquisition), d (discount rate), and T (contract period) are common variables in standard options valuation, and their impact will be similar to the "Greeks" in the Black and Scholes formula, thus their impact is straightforward and not discussed here.

Comparing PRF and FRF, all the parameters that impact the ROV and AET are similar to the common real options model, where the uncertainty only impacts the value after the acquisition. The income that the franchisor receives during the franchise period lowers the threshold of the acquisition over time. Thus, in the FRF case, this value becomes constant. In the PRF case, the uncertainty of waiting is higher, as both the franchise period and company-owned period are influenced by the stochastic process of revenue.

The $\mu_0 X$ (revenue initial drift) and δ (royalty fee) are the only parameters that create a similar impact in both scenarios, the PRF and FRF. If these parameters increase, the franchisor has more incentive to convert, but tends to postpone the conversion. While the AET lengthens due to a positive drift, royalty fee will increases income during the franchise period, and thus the franchisor is better off waiting longer rather than exercising early.

The most distinct result is the observation of revenue volatility, σX. In the FRF case, it acts like the common real options model: the ROV increases and the AET lengthens. For the PRF case, as seen in Figs. 1 and 2, the impact of revenue volatility depends on the royalty fee. The ROV increases and the AET lengthens for a smaller δ (in the base case at $\delta < 13$ %), while the opposite effects happen when δ is considerably high. The explanation for this is that when the royalty fee is high, the franchisor gains profits without risking investment. Therefore, owning a franchise becomes less attractive to the franchisor. In addition, as a larger royalty fee fundamentally reduces the cost of acquisition, the AET becomes shorter.

Table 2 Comparative statics of the base case

Parameter	PRF		FRF	
	Effect on ROV	Effect on AET	Effect on ROV	Effect on AET
$\mu_0 X$	Increases with $\mu_0 X$	Longer with $\mu_0 X$	Increases with $\mu_0 X$	Longer with $\mu_0 X$
σX	Increases with σX for $\delta < 13$ % and decreases with σX for $\delta > 13$ %	Longer with σX for $\delta < 13$ %, and shorter with σX for $\delta > 13$ %	Increases with σX	Longer with σX
$\mu_0 A$	Decreases then flat when $\mu_0 A > 0$	Longer then flat when $\mu_0 A > 0$	Decreases then become zero when $\mu_0 A > 0$	Shorter then become zero when $\mu_0 A > 0$
σA	Increases with σA	Longer with σA	Increases with σA	Longer with σA
c	Decreases then flat when $c > 0.85$	Longer then flat when $c > 0.85$	Decreases then become zero when $c > 0.85$	Shorter then become zero when $c > 0.85$
δ	Increases with δ	Longer with δ	Increases with δ	Longer with δ

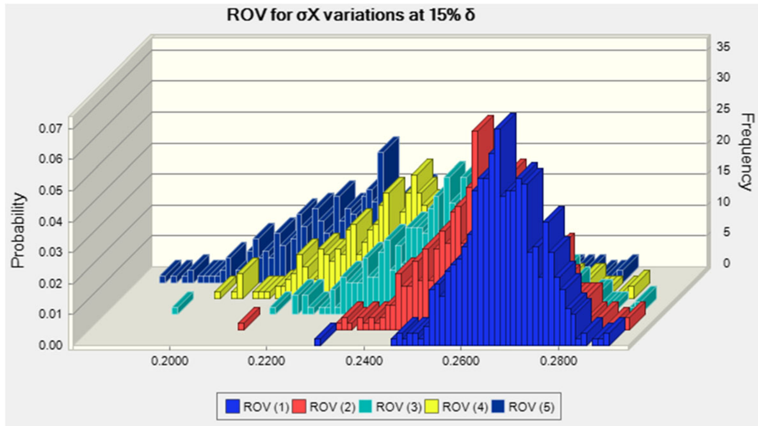

Fig. 1 ROV value with *σX* 5, 7, 9, 11 and 13 % (from front to back). Calculated with 15 % PRF

For the volatility of the agency costs, σ*A*, both ROV and AET demonstrated similar impacts in the PRF and FRF cases, and also in line with the academic premise, but with a rate of impact that was significantly smaller compared to σ*X*.

For the operational costs, *c,* and initial drift for the agency costs, $\mu_0 A$, both had a similar impact on the model since both parameters cause a reduction in the company-owned period income. For PRF, the increased parameters that reached a certain level ($c > 0.85$ and $\mu_0 A > 0$ for base case) remained flat afterwards, while in the FRF, they decrease to zero. Since income from company-owned units is negatively affected as *c* and $\mu_0 A$ rise, the only value left is the accumulation of royalty fee overtime. Therefore, as the income from the franchise period is constant in the FRF case, there is no point for the franchisor to convert the unit. While in the PRF case, the value only comes from accumulated stochastic income from the franchise period.

Overall, in the FRF case, the parameters provide almost an identical impact as in a classical real options call. The uniqueness of our model is in the PRF case, where the franchisor's income before the acquisition is also uncertain, as it depends on a percentage of revenue. In this case, it can be seen, due to this setting, that not only stochastic

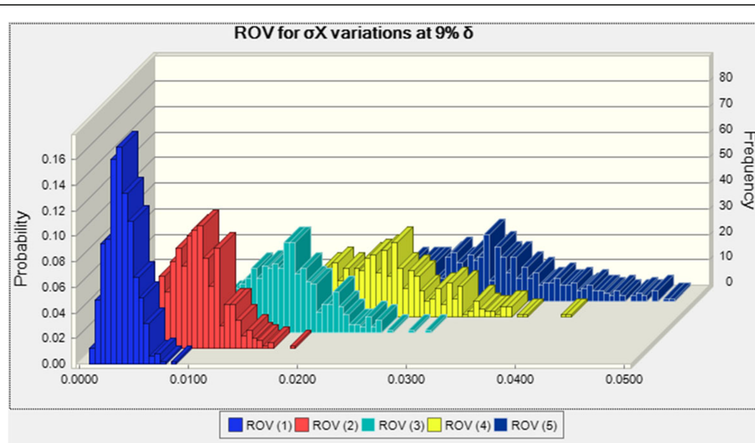

Fig. 2 ROV value with *σX* 5, 7, 9, 11 and 13 % (from front to back). Calculated with 9 % PRF

revenue but also royalty fees play a big role in the franchisor's decision whether and when to convert. This is intuitive, as the franchisor will earn a smaller fraction of revenue even without converting. The justification for the franchisor to exercise the options is the extra profit that could be earned after considering agency costs, which is influenced by the uncertainty of revenue and royalty fee.

In franchising, agency costs are associated with monitoring costs (Brickley & Dark, 1987; Lafontaine, 1992). Since the employees that are assigned are not residual claimants, the franchisor has to put extra effort into monitoring, ensuring that the unit is optimally operated. Thus, this cost is correlated with the distance from headquarters and also the dispersion of the unit (Brickley & Dark, 1987; Norton, 1988; Rubin, 1978). Therefore, choosing a franchise as a method of expansion, the franchisor can reduce or eliminate these agency costs, leading to greater profits if the monitoring of the unit is costly (Scott, 1995). The disadvantage of the franchise form is that the franchisor gets only a small fraction of the revenue in the form of royalty fee.

The royalty fee itself cannot be too high or the franchisor could lose competitiveness. Moreover, as Rubin (1978) points out, as the franchisee invests a large portion of wealth in a single unit, the franchisee will ask for a bigger return than a normal investment as compensation for this diversifiable risk. For a franchise chain that is considerably new and without strong products or well-known brands, the risk is higher. Thus, the franchisors needs to lower the fees in order to attract potential franchisees to join their network.

Conclusion

In this study, franchise ownership redirection using a real options framework is formulated. The uniqueness of the franchise acquisition model compared to a classical real options call model is that the franchisor receives income as royalty fee even before the option is exercised. This income will decrease the threshold of the acquisition cost, which will increase the value of the real options. Thus, unlike the classical real options call model where the decision maker only compares the stochastic income after the acquisition to the constant acquisition price, in this model, the franchisors have to consider the income before the acquisition (royalty fee) as a tradeoff with the extra risk of running their own units in the form of agency costs.

From the hypothetical simulation, the franchisor decision to acquire the franchised unit is mainly driven by the royalty fee arrangement. In contrast with a classical real options call model, the higher volatility of revenue does not necessarily generate a higher real options value. In other words, if the royalty fee is set high, the franchisor will be better off not exercising the real options and instead enjoying profits from royalty fee.

As pointed out by Mathews et al. (2007b), the importance of real options valuation is that it is essentially based on real options thinking. The franchisor that faces the opportunity to optimize profit by converting the franchise unit to a company-owned unit should negotiate with the franchisee before signing the contract. The real options method is a strategic tool that can be embedded in the financial contract to take advantage of the hidden opportunity of the future's uncertainty.

Abbreviations

AET: Average exercise time; FRF: Flat royalty fee; GBM: Geometric Brownian Motion; Log DD: Log discrete time diffusion; LSM: Least Square Monte Carlo; NPV: Net present value; PRF: Percentage royalty Fee; ROV: Real options valuation

Competing interest
The author declares that he has no competing interests.

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