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vFIN 2006-08-01

# Fair and Reasonable Royalty Rate Determination - When is the 25% rule applicable?

**by**
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**Article submitted to LES Nouvelles**

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Comments by Ove Larson, Tom Ewing and Marcus Holgersson and the financial support from Lars Erik Lundberg's Foundation for Research and Education is gratefully acknowledged.

# 1 Background

What is in some general sense fair and reasonable in royalty rate determination is not clear despite (and maybe partly also because) of a longstanding debate. As often in complex uncertain situations simple rules of thumb then tend to emerge and over time set some standard rule of reason and fairness. The so called "25% rule" is a well-known example. Its rationales and practical use have been widely discussed. (See in particular Goldscheider 1995, 2002 and Razgaitis 1999, 2003.) The rule has some variants but essentially says that a license buyer (licensee) should pay 25% of his operating profit before depreciation and taxes (and before royalties) in royalties to the license seller (licensor) for an exclusive license.

# 2 Purpose

The purpose of this article is to provide a general but still simple approach to a fair and reasonable royalty rate determination and especially demonstrate when the 25% rule is applicable. The article starts with the simplest case of an exclusive license deal with discounting and uncertainty ignored. It is then shown that the logic of the basic general rule - of which the 25% rule turns out to be a special case- is not significantly changed when accounting for discounting and uncertainty (and thereby risk), at least under reasonably simplifying assumptions.

# 3 Exclusive license without discounting

Consider first the simplest case when a license seller has invested $I_s$ \$ in developing a technology and then sells an exclusive license for a total amount L \$ in royalties to a license buyer who subsequently invests $I_b$ \$ in production and marketing in order to generate $\Pi_{op}$ \$ in operating profit, that is profit before depreciation and taxes, for the contract period. Although the contract period may be long we will first consider the case when interest rates are so low so we can neglect them, that is we do not have to account for discounting.

The seller's net profit $II_5$ and the buyer's net profit $II_b$ are then (before taxes):

$$\Pi_s = L - I_s$$

$$\Pi_b = \Pi_{op} - I_b - L$$

It is now reasonable to assume that the seller's and buyer's decisions to invest are based on an evaluation of their respective rates of return on investment, Ro.[2] The rate of return on investment for the seller and buyer are:

$$RoI_s = \Pi_s / I_s = L/I_s - 1$$
$$RoI_b = \Pi_b / I_b = (\Pi_{op} - L)/ I_b - 1$$

It is further fair to assume that the seller and buyer will bargain in order to reach an agreement which is fair in the sense that the rates of return on their respective investments become equal (or at least close enough), that is $RoI_S = RoI_b$. This implies:

$$Ro\ I_s = L / I_s - 1 = RoI_b = (\Pi_{op} - L)/ I_b - 1, \text{ that is}$$
$$L = \Pi_{op} * I_s /( I_s + I_b )$$

In other words if $II_{op}$ is used as a royalty base, the royalty rate is simply the seller's share of the total investments on both seller and buyer side, that is $I_s/(I_s+I_b)$.

Now the seller's share of the total necessary investments in R&D, production and marketing for commercializing a new technology could obviously vary a great deal. A small start up company which sells an exclusive license on an early-stage technology has typically only invested in a part of all R&D needed and may perhaps only account for say 10% of all necessary investments in complementary assets. Moreover, the earlier the license is sold in the technology development process, the lower is the technology developer's share of total investments and thus his fair royalty rate. This explains (apart from risk considerations and weak competition for the exclusive license) why royalty rates are observed to be low in early-stage licensing, especially in capital-intensive industries.

On the other hand, a large company selling a late-stage technology in an R&D intensive industry with a minor need for complementary investments in production and marketing, as in the case of some pharmaceutical areas, may argue for a quite high royalty rate, even well beyond 50%.

[2] The presence of sunk cost may complicate the evaluation, depending upon when it is made and the time schedule for investments and license contracting. Strictly speaking sunk costs should be disregarded. They could e.g. be disregarded in case of forward selling of the license or if there is competition among potential licensees with sufficiently low hurdle rates of return.

## 4 The 25% rule

Now, the "25% rule" obviously is applicable when the seller's share of total investments under the conditions described above is 25% (or thereabout, practically seen).

Although the seller's investment share depends upon a number of factors, in particular the type of technology, industry and market involved and the development stage at which the license is sold, an investment share of roughly 25% may be quite common in a number of industries. For example, consider the situation when companies specialize in R&D for selling licenses to companies with comparative advantages in production and marketing. The seller's investment share then roughly corresponds to the R&D share of total investment in R&D, production and marketing. If there is no reason to assume that any of these three components of total investment is significantly larger than any other, the R&D share could in principle be assumed to be roughly 33%, which then would be an upper limit of any fair and reasonable royalty rate. This is seldom the case, however.[3]

In light of the increasing magnitude of R&D investments in new products and processes also relative to production and marketing investments in some industries, any past percentage rule based on license/seller's investment share like the 25% rule has to be revised upwards, everything else equal. Likewise a trend towards selling licenses at earlier stages of technology development would have to revise such a rule downwards.

## 5 Exclusive license with discounting

Now consider the case when discounting the cash flow is advisable in order to take high interest rates or high costs of capital or long contracts or long planning horizons into account. Consider first the seller's and buyer's net profits associated through periodization to time period no. t (e.g. year t):

$$\Pi_{st} = L_t - I_{st}$$

$$\Pi_{bt} = \Pi_{opt} - I_{bt} - L_t$$

[3] For detailed studies of the distribution of innovative investment expenditures across R&D, production and marketing, see Mansfield et al. (1977).

Discounting these net profit flows to their net present values (letting NPV denote the discounting operation) using a constant discount rate, same for both seller and buyer, gives:[4]

$NPV\Pi_{st} = NPVL_t - NPVI_{st}$

$NPV\Pi_{bt} = NPV\Pi_{opt} - NPVI_{bt} - NPVL_t$

Performing the same calculus operations as in the preceding case, that is calculating the respective RoI ratios amd equalizing them gives

$NPVL_t = NPV\Pi_{opt} * NPVI_{st}/(NPVI_{st} + NPVI_{bt})$

In other words the fair and reasonable royalty rate equals the seller's share of the total discounted investment expenditures, now with the discounted operating profits as the royalty base.

In the common case when most of the seller's investments precede those of the buyer's this means that a higher discount rate, reflecting a higher cost of capital, will give a higher royalty rate.

## 6 Exclusive licensing under uncertainty

Finally, uncertainty is always present in licensing. From a pure theoretical point of view - and thereby disregarding the problems involved in estimating probabilities for different outcomes - uncertainty does not significantly complicate the analysis in principle.[5]

This is seen from taking expected values E of the net present value NPV of the net profits for the seller and buyer respectively as formulated above, and then calculating the ratios of expected discounted returns to expected discounted investments for the seller and buyer, and finally equalling these two ratios in the spirit of fairness. Then the fair and reasonable royalty rate r becomes, equal to the seller's expected discounted investment share of the total expected discounted investments, that is:

$$r = ENPV\ I_{st} / (ENPV\ I_{st} + ENPV\ I_{bt})$$

[4] Discounting with different discount rates for the seller and buyer or using different lending and borrowing rates significantly complicates the analysis and is left aside here. Discounting with different discount rates may be called upon when the seller and buyer have significantly different needs for or access to financial capital.

[5] Here we assume the licensor and licensee are both risk neutral. If they have different risk aversion and money utility curvatures the analysis is significantly complicated.

and the royalty base is the expected discounted operating profit, that is ENPV $II_{opt}$. Thus the same business logic prevails also when uncertainty is taken into account.

## 7 Summary and Conclusions

Well founded and broadly accepted rules and models for valuation and pricing of licenses are essential for the well functioning of technology markets. (Just as valuation and pricing of options is important for the financial derivatives markets.) As licensing and technology markets get increasingly important and broad based the traditionally used rules of thumb have become subjected to challenges and scrutiny[6].

One such rule is the so called 25 % rule, essentially stipulating that the licensee should pay 25 % of earnings before interest and taxes (i.e. 25% on EBIT) to the licensor. The purpose of this paper has been to provide a general but still simple approach to a fair and reasonable royalty rate determination. The paper especially demonstrates when the 25 % rule is applicable as a special case.

It was first shown that in the simplest case of an exclusive license deal the fair royalty rate is simply the licensor's share of total investments (in R&D, production and marketing) necessary for exploiting the technology on product markets, (or further intermediate technology markets). A fair and reasonable deal is then interpreted as a deal equalizing the RoIs (return on investments) of the trading partners. The licensor's investment share is determined by many factors in turn, especially the stage of technology development at which the license is sold, the need for investments complementary to R&D and technology investments. While the selling stage is determined by factors such as supply of finance, licensor strategy and capabilities, technology readiness and demand for the technology, the need for R&D complementing investments depend on industry characteristics such as capital intensity of production and marketing but also on sunk costs.

Empirical studies of R&D investment shares of total investments may then provide industry-specific guidelines of an observed drift towards lower or higher percentages used in some industries.

When discounting is factored in, the basic rule still applies, but with discounted operating profits as the royalty base. A higher cost of capital then

[6] See e.g.Granstrand (1999) and Granstrand (2004).

gives a higher royalty rate in the common case of licensor investments essentially preceding licensee investments over time. Similarly taking uncertainty and risk into account through expectations does not significantly change the business logic of the basic rule. The proper royalty base now becomes the expected discounted operating profit. Nevertheless the significant practical problems of finding proper expected values remain.

Thus, a fair and reasonable royalty rate could be determined in exclusive licensing situations based on the buyer's and seller's investment shares of total investments, with operating profit before depreciation and taxes (i.e. EBIT) as the royalty base. The royalty rate is then fair in the sense that it equalizes the return on investments for the buyer and seller. This basic rule is valid also when discounting and uncertainty have to be taken into account. The so called 25% rule applies specifically to situations when the license seller's investment share is 25% of total investments.

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