A Simple Method For Calculating A "Fair" Royalty Rate

By Damien Salauze

Introduction

During a licensing deal (*i.e.* license of a patent protecting a product), several methods are commonly used to determine what is intended to be a "fair" royalty rate. It is even recommended to combine several methods in order to cross-check that there is no discrepancy between one method and another. These methods fall into three typical groups [1-4]: (i) comparison with previous similar deals done by others, (ii) alignment with industry or internal practice, and (iii) calculation.

In light of a common experience, it appears that comparison with previous similar deals is always questionable because, even if data are extracted from a reliable database, negotiators have the feeling that no deal is really similar to the deal they are currently discussing.

Alignment with industry or internal practice is generally frustrating when one of the parties does not belong to the industry (*i.e.* an academic institution), or when one of the parties has limited bargaining power. Therefore, sentences such as "we have always done it like that," or "there is no way that the rate should be out of this usual range," are very unlikely to create a "win-win" feeling.

Calculation is often felt to be more rational. However, calculation may rapidly become complex, especially if one takes into account probabilities and wishes to introduce options, and relies heavily on the assumptions that are introduced [4]. In addition, calculation-based methods usually do not take into account the amount of money to be invested by the licensee to license and its subsequent associated risk.

At Institut Curie, which is an academic research institution, we have introduced a relatively simple calculation-based method which allows sharing the "benefit" made by the licensee and which - very important - takes into account both the amount of money to be invested by the licensee further to license, and its subsequent associated risk. This method is so far satisfactorily used, in the sense that its outcome is felt by parties to be both rational and fair. This method is applicable to any kind of business, although Institut Curie is primarily involved in life sciences (it is a Paris-based Comprehensive Cancer Center created one century ago by Marie Curie when she received her second Nobel Prize).

Parameters to be Taken Into Consideration

At this stage, let's consider a pure royalty-based calculation (there is no upfront payment, no milestone payments, and royalties are a percentage of the sales of the product protected by the patent). Let's also consider that the license is an exclusive license, and let's exclude sublicense issues. The typical case is that of the license of a patent (considered as granted), that protects a product which is still in the development stage (*i.e.* several years are still needed prior to marketing, and significant investment is still needed to be made, at a certain level of risk).

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In fact, royalty is nothing else than a share of the "benefit" made by the licensee, which is paid to the licensor. Therefore, three questions arise at this stage: (i) how to define the "benefit"? (ii) how to take into account the investments to be made prior to marketing stage, the required time to develop the product, and the associated risk? and (iii) how to share the "benefit"?

There is no universal definition of "benefit." Depending on the country (many deals are concluded between parties coming from different countries where accounting principles and/or habits are different), depending on the perspective (*i.e.* operating, accounting, financing, …), "benefit" covers different notions. For example, "accounting benefit" which is the easiest to access since it is included in the profit and loss statement of every company, neither reflects the level of investment of a company for developing a product, nor the financial risk taken by the licensee. Its format in many countries is set-up for tax reasons, and is therefore not easy to handle for the purpose of royalty rate determination. Let's, therefore, introduce a "for the purpose of royalty rate calculation benefit" called "B."

B is calculated after establishment of a "simplified provisional profit and loss statement" (SPPLS) related to the product protected by the patent (see Table 1

and Table 2). In order to establish SPPLS, one has to consider two phases: (i) pre-marketing phase during which there are only expenses and no revenues (R&D costs, registration costs, pre-production costs, pre-marketing costs, …)—see Table 1, and (ii) marketing phase during which there are still costs (residual R&D costs, production costs, marketing costs, …), which are hopefully balanced by revenues—see Table 2. Between these two phases, there is what we call "moment zero" (M_0), which may correspond for drugs to the day the marketing authorization is granted. In fact, this is just a virtual moment, taking place between December 31st of year-1 and January 1st of year$_{+1}$, allowing calculation of the present value of investments.

Costs of the first phase are added year by year, after application of a discount rate in order to take into account the financial risk taken by the licensee. This rate is generally between 8 and 20%. It reflects the risk taken by the licensee at investing financial resources in the project (*i.e.* the return on investment the licensee would have had if it would have invested these resources in its current business). Thus, 100 Euros invested one year prior to M_0 account for 115 Euros if the discount rate is 15% (discounting factor DF = 1.15). On the same basis, 100 Euros invested three years prior to M_0 account for 100 x 1.153, thus 152 Euros. The invested amounts during this pre-marketing phase take into account all the expenses that the licensee has to make in order to market the considered product. All these costs are summed up, the sum being called "Σ."

$$\Sigma = Z \times (DF)^n + \ldots + C \times (DF)^3 + B \times (DF)^2 + A \times (DF)^1$$

This Σ will have to be "amortized" during the second period (*i.e.* deducted from revenues for the calculation of B). Arbitrarily, it is proposed that Σ be amortized over a 10-year period if the patent expires later than ten years after M_0, and therefore, Σ/10 is added each year to provisional costs of the second phase during the first ten years.

For the second period, costs are deducted from revenues. These costs include not only Σ as explained earlier, but also production costs (all costs incurred by licensee to produce units of product sold), marketing costs (all costs paid by licensee to market units of product sold), and sometimes residual R&D costs (all potential direct R&D expenses that licensee has to make in order to optimize the production of the units of the considered product). Noticeably, if an important investment is required after M_0 for the production of the product (*e.g.* a new plant), this investment also has to be amortized. In addition, residual R&D costs cannot include expenses linked to new products (that must be treated separately). Thus, for a given year x, Bx is calculated as follows (and does not take taxes into account):

$$Bx = Sx - \Sigma/10 - Px - Mx - Rx$$ (with Σ/10 not taken into account after year 10)

At the beginning of this second period, costs may be higher than revenues. Therefore, an "average provisional benefit" called "APB" is calculated over a long period (for example the first ten years) in order to smooth low and high values. On the same way, "average provisional revenues/sales" called "APS" can be calculated.

$$APB = (B_1 + B_2 + \ldots + B_n) / n \text{ and } APS = (S_1 + S_2 + \ldots + S_n) / n$$

Now arises the difficult issue of sharing APB between licensor and licensee. A rule of thumb is to consider the "25% rule" [5], according to which "licensor is legitimate at receiving 25% of the benefit." In general, an agreement is found between 25% and 50%, generally around 33% (*i.e.* 1/3 for licensor, and 2/3 for licensee).

The next step is to express APB as a percentage of APS since revenues are the easiest figure to take into account (and to control). For example, if APS is 100 and APB is 30, APB is 30% of APS. If it is agreed that the licensor has to receive 1/2 of APB, the royalty rate is 15% of revenues/sales (10% if agreement is made on 1/3, and 7.5% if made on 1/4). This royalty is (generally) due to the licensor until patent expiry.

As can be seen, key parameters to be taken in consideration are (i) the share of APB due to licensee, (ii) discount factor, (iii) invested amounts prior to M_0, (iv) revenues/sales, and (v) production, marketing and residual R&D costs.

Discussion

Share of APB

It appears from our experience that getting to an agreement on how to share APB is relatively easy, although this is the major factor impacting the determination of royalty rate. We are all used to lengthy bargaining for fractions of a percent, which generally leads to frustrations. Surprisingly enough, agreeing on 1/2, 1/3 or 1/4 (or any other "simple" figure) is much more straightforward, most probably because it is felt by parties to be "clear" and "fair." From our academic point of view, we feel that previous costs and efforts have to be considered as sunk costs and efforts at the licensing point, and thus receiving 1/2, 1/3 or 1/4 of

the benefit with having no further investment and effort to make is a fair deal. The common feedback we get from licensees is that as long as their financial effort (prior to M_0 and after M_0) and the associated risk are taken into consideration, paying 1/2, 1/3 or 1/4 of the benefit to the party which allowed to entry into the business is also a fair deal.

Discount Factor

Discussion on discount factor is generally very short. The reason is that each type of industry sector has its own standard discount factor, which is in general known by the parties.

Invested Amounts Prior to M_0

Although every negotiator has standard figures of his industry sector in mind, it is sometimes difficult to evaluate the required investments because they may vary from one product to another, and because at the stage of the negotiation, the definition of what the product will consist of is not fully clarified (this is in particular more of the case for patents covering a technology than a well-defined product, or for technologies or product which are still very far from the marketing stage). The second main issue here is to evaluate the duration of product development stage. Although it can be very easy for some products, such as devices close to the marketing stage, it may be very complex for some other products, such as not-fully-defined products far from the marketing stage. These two parameters are those leading to the toughest discussions. However, the impact of these parameters on the final calculation of the royalty rate, although significant, is not so high (and at least lower than the impact of the share of APB).

Revenues/Sales

Projections on revenues may vary significantly depending whether the projection is made by the licensor or the licensee. However, from our experience, it is relatively easy to identify comparables. In addition, with royalty being a percentage of revenues, what matters is not the level of revenue per se, but rather the amount of revenues in comparison with the amount of costs which are not directly linked with sales (*i.e.* costs prior to M_0 for example, or fixed costs of production or of marketing). Therefore, the impact of the revenue parameter on the calculation of royalty rate, although significant, is not so high.

Production, Marketing and Residual R&D Costs

In general, most of these costs are considered as a percentage of revenues, with well established industry standards. Therefore, the impact of the uncertainty linked to these parameters is minimal on the calculation of royalty rate.

Possible Revision of Parameters

Nevertheless, in spite of the simplicity of the above-described calculation process, its main pitfall is that it is to some extent based on forecasts. Although negotiators generally work together in good faith on these forecasts and finally agree on common figures, a certain level of uncertainty remains, especially for technologies or products which are still far from the marketing stage. One way to mitigate the consequences of this uncertainty is to introduce a clause in the contract, allowing revision in the value of parameters used for the calculation, at a moment when most of the figures will be either known or much more reliable. The condition is of course to use the same spread-sheet and the same definition of terms. We generally introduce a clause allowing the revision of the parameters on year$_{+3}$. At this stage, all the expenses prior to M_0 are known, the duration of the product development period is known, and the vision on the future level of revenues and on the future costs during marketing phase is much more accurate.

The main advantage of this possible revision is to guarantee the licensee that the share of the benefit he will pay to the licensor will not exceed the threshold defined during the negotiation. This is in particular very important for start-up companies whose management and shareholders (especially new entrant shareholders, such as venture-capitalists) try to reduce their level of risk, and for players entering into a new market for which little is known. The main disadvantage of this revision is that it may force the licensee to open its books to licensor in order to disclose real figures. However, should one want to avoid this situation, the clause may stipulate that the revision can be decided at the sole discretion of the licensee. This means that if the difference between the royalty rate calculated with "real" figures is not very different from that calculated with forecasts, the licensee may prefer to stay with the initially-calculated royalty rate, instead of having to open its books. Of course in such a case, the trend during the initial negotiation is to use parameter values which are slightly more favourable to the licensor in order to compensate for the asymmetry.

Introduction of Upfronts and Milestones

When the license is concluded with royalties only, there is no need to take into account the probability of success of the project, because if there is a royalty it means that there has been (at least a partial) product development success. However, when the decision is made to introduce upfront and/or mile-

stones, probability of success has to be taken into account. For example, if it is decided that a quarter of the "potential royalty" called "PR" be paid upfront at signature, another quarter paid at milestone, and the remaining half paid as "real royalty" called "RR," one has to calculate the present value of PR/4 at the date of signature, and the present value of PR/4 at the date the milestone is supposed to occur. The same above-mentioned discount factor DF is used.

For example, if PR is X% of revenues, RR will be X/2% of revenues and its amount will be linked to real revenues. For calculating the amounts due as upfront and milestones payments that will take place prior to any revenue, one has to calculate PR for each year covered by the patent during the marketing phase: PR_1, PR_2, … PR_n. For example, let's consider that the upfront takes place on $year_{-a}$ and that the agreed milestone takes place on $year_{-b}$. Let's also consider that on $year_{-a}$, the probability of success (*i.e.* that things go as planned) is p, and that on $year_{-b}$, this probability is q. The risk-adjusted net present value (rNPV) of the upfront payment on the date of signature is therefore :

$$\text{rNPV of upfront} = \{(PR_n/4) / DF_n + a + (PR_{n-1}/4) / DF_{n-1+a} + \ldots.. + (PR_1/4) / DF^{1+a})\} \times p$$

Using the same reasoning, the rNPV of the milestone payment on the date the milestone will occur is:

$$\text{rNPV of milestone} = \{(PR_n/4) / DF^{n+b} + (PR_{n-1}/4) / DF^{n-1+b} + \ldots.. + (PR_1/4) / DF^{1+b})\} \times q$$

Of course, rNPV of upfront is lower than rNPV of milestone, but licensor may prefer to get less, much earlier with certainty, than more, later with uncertainty. There is no new concept here, but it illustrates that the spreadsheets described in Table 1 and Table 2, which are used to calculate the royalty rate, can also easily be used to split payments into upfront, milestone and royalty payments.

Real Case

Let's take an example adapted from a real case that was negotiated in 2009. Institut Curie owns a patent on a technology which allows chemical coating of some materials that are used to produce medical devices. This coating prevents bacterial adhesion, and thus is expected to prevent infection after the device is introduced into the body. Licensee is a medical device company with worldwide marketing capabilities (through distributors in some countries). At the time the license was negotiated, some proofs of concept were already existing, but a lot of (risky) work was still to be conducted (scaling-up of the coating process, adaptation of manufacturing process, assessment of efficacy against infection in animal models, …). In other words, there was still significant money to be invested prior to any sales.

Therefore, the fist decision was to agree on the process to be used for calculating a "fair" royalty rate. It was agreed that the spreadsheets from Tables 1 and 2 would be used, and both parties worked together in order to fill these tables under "reasonable assumptions." Discount factor to be used was set at 1.12. It was agreed that investments made prior to M_0 would be amortized over a 10-year period. It was agreed that the weight of the patent covering the technology was 80% in comparison to other minor patents (weighing thus 20%), and that a third of the average benefit (after having taken into account the above-mentioned 80%) would be paid to the academic institution as a royalty. Patent expires in 2024, so that the licensee will stop paying royalties after this year.

Table 3 summarizes the amounts invested prior to M_0, and Table 4 summarizes revenues (sales of

Table 1. Principle Of A "Simplified Provisional Profit And Loss Statement" (SPPLS) Related To A Product Protected By A Patent
First phase (prior to "moment zero": M_0)

	$Year_{-n}$	…	$Year_{-3}$	$Year_{-2}$	$Year_{-1}$	M_0
Invested amounts	Z	…	C	B	A	-
Value at M_0 of invested amounts	$Z \times (DF)^n$	…	$C \times (DF)^3$	$B \times (DF)^2$	$A \times (DF)^1$	Σ

- M_0 : this is a virtual moment, taking place between December 31st of year -1 and January 1st of year +1, allowing to adjust the values of investments.
- Invested amounts: takes into account all the expenses that the licensee has to make in order to market the considered product.
- Discount factor (DF) is generally in the 1.08 to 1.20 range (typically 1.15 for pharmaceuticals)
- $\Sigma = Z \times (DF)^n + \ldots + C \times (DF)^3 + B \times (DF)^2 + A \times (DF)^1$.

Table 2. Principle Of A "Simplified Provisional Profit And Loss Statement" (SPPLS) Related To A Product Protected By A Patent
Second phase (further to M_0)

	M_0	Year $_{+1}$	Year $_{+2}$	Year $_{+3}$	...	Year $_{+10}$	Year $_{+11}$	...	Year $_{+n}$
Revenues (sales)	-	S_1	S_2	S_3	...	S_{10}	S_{11}	...	S_n
Amortization	-	$\Sigma/10$	$\Sigma/10$	$\Sigma/10$	...	$\Sigma/10$	0	...	0
Production costs	-	P_1	P_2	P_3	...	P_{10}	P_{11}	...	P_n
Marketing costs	-	M_1	M_2	M_3	...	M_{10}	M_{11}	...	M_n
Residual R&D costs	-	R_1	R_2	R_3	...	R_{10}	R_{11}	...	R_n
B (benefit)	-	B_1	B_2	B_3	...	B_{10}	B_{11}	...	B_n

- Year +1: first marketing year of the considered product
- Production costs of year x include all costs incurred by licensee to produce units of product sold during year x. If an important investment is required after M_0 (*e.g.* a new plant), this investment has also to be amortized.
- Marketing costs of year x include all costs paid by licensee to market units of product sold during year x.
- Residual R&D costs of year x include all potential direct R&D expenses that licensee has to make in order to optimize the production of the units of the considered product (to the exclusion of expenses linked to new products that must be treated separately).
- Benefit of year x is defined as : Bx = Sx - $\Sigma/10$ - Px - Mx - Rx (with $\Sigma/10$ not taken into account after year 10).

Table 3. Simplified Provisional Profit And Loss Statement: Prior To M_0

In k€	2010	2011	2012	2013	M_0
Invested amounts	1,000	1,000	2,000	2,000	-
Value at M_0 of invested amounts	1,574	1,404	2,509	2,240	7,727

Table 4. Simplified Provisional Profit And Loss Statement: Further To M_0

In k€	M_0	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenues (sales)	-	3,600	7,200	17,100	23,400	32,400	39,900	45,000	48,600	50,400	50,400	50,400
Amortization of investment	-	772.7	772.7	772.7	772.7	772.7	772.7	772.7	772.7	772.7	772.7	0
Production costs	-	1,440	2,880	6,840	9,360	12,960	15,960	18,000	19,440	20,160	20,160	20,160
Marketing costs	-	1,080	2,160	5,130	7,020	9,720	11,970	13,500	14,580	15,120	15,120	15,120
Residual R&D costs	-	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
B (benefit)	-	-692.7	387.3	3,357	5,247	7,947	9,797	11,327	12,407	12,947	12,947	14,120

- APS (average provisional sales over the 11-year period) = 33,491 k€
- APB (average provisional benefit over the 11-year period) = 8,163 k€
- APB/APS = 24.37%

the devices treated by the technology protected by the patent to hospitals), amortization of investments made prior to M_0 (over 10 years) marketing costs (30% of sales), production costs (40% of sales), and residual R&D costs (which were anticipated to be significant in this case). The average provisional benefit (APB) was calculated to be 8,163 k□, while the average provisional sales (APS) was calculated to be 33,491 k□. Therefore, APB/APS was 24.37%. Provided that it was agreed that the weight of the licensed patent represented 80% of the whole intellectual property deserving royalty, and that the licensor would get a third of the benefit, the royalty rate was calculated as being 24.37% x 80% x 33% = 6.5% of sales.

Since the deal was structured so that there would be no milestone payments, no additional calculation was required.

Conclusion

This simple method for calculating a "fair" royalty rate is derived from the empirical "rule of the 25%" described in the excellent review from Goldschreiber et al. [5], although this rule has recently been criticized by the United States Court of Appeals which felt "it is a fundamentally flawed tool for determining a baseline royalty rate in a hypothetical negotiation" [6]. However, the described method provides technology transfer managers with a spreadsheet and its associated feeling of rationality. The big difference with the "pure 25% rule" which consists in sharing the profit by four, is that this method takes into account the previous investment effort made by the licensee and the associated risk taken; whereas simply sharing the margin (which has to be clearly defined) takes only into account the expenses of the considered year and does not at all take into account the associated risk. This is a very important point when the deal is on technologies or products that require long, expensive and risky development periods. This latter situation represents the large majority of cases of technology transfer between academic institutions and industrial partners, or between mid-size companies and large companies with worldwide product development and marketing capabilities.

In our experience, this simple method is very efficient at reducing the duration of the negotiation because it reduces the perceived risk of negotiators. The licensee cannot afford to pay too much, while the licensor cannot afford to receive less. Once an agreement is found on the "fair" share of benefit to be received by each party, and on what has to be introduced into the spreadsheet, most of the job is done.

Last but not least, the possibility left to revise the value of parameters three years after the initiation of the marketing phase is always very appreciated (although the offer is sometimes declined). It is reassuring for both the licensee (who knows that it will not pay too much) and for the licensor (who knows that he has secured a certain level of royalty), and creates a climate of confidence prone to a "win-win" feeling, which is very favourable to business with a long-term perspective. Our experience is not long enough to report a percentage of licensing deals for which the value of parameters has been revised, but my guess is that it should be much lower than anticipated, either because the value of parameters does not influence very significantly the calculation, or because for whatever reason licensees prefer to keep their books closed to licensors. ■

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