# A NEW NHL SALARY MODEL

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**HERE'S A NEW AND INTERESTING METHOD of using actuarial skills that could put an old way of determining professional athletes' salaries on ice.**

As a longtime sports fan, I always wondered why presumably serious people could in a blink of an eye determine how much to pay a pro athlete. I have seen many generations of players and how, over time, the influence of a few individuals has changed the picture in determining the financial value of a player illustrated by his salary. As an actuary, I have always thought a more rational and/or scientific approach could be used to do so. This article, derived from the paper I presented for the Entrepreneurial Actuaries Section contest held last summer, explains how I would deal with the problem of determining a pro athlete salary with a new model. The model is based on determining an economic value for each athlete and could help replace the existing method which is based principally on salary comparisons between players with similar statistics. The economic value is based on the value-added brought by each player to the franchise according to eight identified components. These economic values will help team executives in determining players' salaries in light of their financial impacts. Even though this article relates to the NHL, I think the same approach, with some adjustments, could be applied to other professional sports.

## THE RABELAIS APPROACH AND ITS CONSEQUENCES

Historically, due mainly to player agents and a lack of viable financial tools, determining how much an organization should pay one of its players has too often been based on irrational factors like a comparison of similar players. The problem with this kind of emotional behavior is that these other players have also been evaluated based on previous comparisons. With this chain of comparisons, one erroneous link will lead to an important derailment of the evaluation process. Such a comparison process has been historically severely impaired by franchise owners willing to buy a championship or general managers overestimating a player.

Given that since the 2005 labor dispute the NHL operates under a salary cap and floor concept, it is clear that every team could benefit from a tool that would help them allocate salaries based on the real economic value of each player. Salaries represent nearly 60 percent of total operating costs and complex parameters like the North American economy and the currency value for Canadian teams call for a better method than the emotional one currently being used. This should be beneficial to the league on a long-term basis.

Contract negotiations have become increasingly difficult due mainly to agents and the NHLPA (National Hockey League Players' Association) that were able in the past to play the comparison game in such a way that teams now need to respond with rational arguments to make sure that the negotiation process is fair. The NHL is a multi-billion-dollar industry and to determine nearly 60 percent of its costs by looking at what the neighbor does seems to me as foolish as acting like a Panurge sheep.[1]

Managing nearly three-fifths of your operating costs freely without any concrete data regarding the financial benefits coming from a player is obviously risky, but without any tools helping to address the problem, we can hardly blame pro teams for operating like they do now. The cost of a given salary is clear, but what about the benefits? Any organization operating in such a way that it cannot explain how one of the two components in a cost/benefit analysis is determined, is managing its business dangerously. Many teams already operate at a loss which should give us a hint that more sophisticated tools are needed. To continue spending most of the budget in such a guessing way could lead the NHL into major trouble since teams in financial distress create problems like bankruptcy, relocation, league supervision, poor league image and lack of parity. These are the kind of problems that could even put the NHL's existence in jeopardy.

## A NEW APPROACH: THE ECONOMIC VALUE CONCEPT

This proposal is based on trying to allocate a true financial value to each player within an organization. It identifies eight components that, once actualized with actuarial assumptions regarding the usual contingencies and a given set of industry assumptions, will help determine a player's salary. Other components could be added if necessary. In determining the assumptions, some parameters,

FOOTNOTES:

[1] This is a French expression based on a Rabelais story on how a flock of sheep could be lost when they all follow the first one falling into the ocean.

as described below, would have to be taken into account. These components are:

**Direct additional ticket sales revenues (S)**
These revenues would be additional revenues provided by an increase in ticket sales due to the inclusion of the player in the roster. If the team is in a "sold out" situation, the following question must be answered: "By how much could we increase the price of our tickets without losing our sold out situation with this player on our team?" If the team is not in a sold out situation, the question becomes: "How many more tickets could we sell by including this player on our roster?"

**Ancillary revenues from additional ticket sales (A)**
These revenues would come from additional revenues for each new customer. They include parking fees, food and beverages. Existing statistics regarding how much each fan spends on average for these, say $X per event or Y percent of the ticket revenues, would be used. The model allows increasing the value of X or Y if adding the player improves significantly the team's performance and past experience shows that values of X and Y then increase.

**Marketing revenues (M)**
These revenues would come from additional derivative products sales made following the player acquisition. Included in this component is additional sponsorship with the player on the team or compensation coming from a public or commercial entity that would benefit from signing the player.

**Additional broadcasting revenues (B)**
This is calculated by actualizing the difference in local television and radio broadcasting revenues with or without the player presence on the roster. Similar national contract differentials would not be taken into account here, but within the component (L).

**Performance value (P)**
Basically, this component is the additional postseason revenues that the team would be able to collect because the player is now part of the team. This is highly subjective and management judgment plays a crucial role for this. The model needs to use parameters such as player relative caliber (including talent, leadership, attitude, injury proneness and experience), complementarity and chemistry, player position and total revenues brought by additional postseason games.

**Franchise value (F)**
Hiring a player could generate an increase in franchise value. This increase could come from two sources: firstly, if the salary paid is lower than the economic value; secondly, if adding the player produces an impact on the competitiveness and/or the image of the team, thus improving rankings, profitability or notoriety.

**Player market value (D)**
When a player is hired, he has a market value and this should be assessed and translated in terms of dollars. If the contract is signed over a period of years, we have to estimate the market value of the player at the end of this period taking into account that the player could then be a free agent. The difference (positive or negative) between the two values should be used in determining the economic value. This is like an amortization cost.

# Figure 1: Athlete: X

| ACTUALIZED ECONOMIC VALUES | | DERIVED SALARY | |
|---|---|---|---|
| Contract | Tickets | Ancillary | Marketing |
| 1 Year | 8,497,170 $ | 1 Year | 9,330,323 $ |
| 2 Year | 15,282,911 $ | 2 Year | 8,404,846 $ |
| 3 Year | 21,354,677 $ | 3 Year | 7,833,862 $ |
| 4 Year | 24,087,576 $ | 4 Year | 6,654,874 $ |
| 5 Year | 28,016,025 $ | 5 Year | 6,197,018 $ |

# Figure 3: Assumptions

| | At Signature | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|
| Cost of time | | 12% | 12% | 12% | 12% | 12% |
| Increase in ticket price with player | | 5.00 $ | 5.00 $ | 5.25 $ | 5.51 $ | 5.79 $ |
| Death probability (1 out of) | | 3000 | 3000 | 2950 | 2900 | 2850 |
| Probability of disability off sport (1 out of) | | 80 | 80 | 80 | 80 | 80 |
| Minor injury probability (1 out of) | | 20 | 20 | 20 | 20 | 15 |
| Major injury probability with risk of retirement | | 0% | 3% | 5% | 8% | 10% |
| Ratio ancillary/tickets | | 7% | 7% | 7% | 7% | 7% |
| Ratio postseason price/regular season price | | 125% | 125% | 125% | 125% | 125% |
| Ratio player salary/value | | 100% | 100% | 100% | 100% | 100% |
| Minimum salary | | 300,000 $ | 300,000 $ | 300,000 $ | 300,000 $ | 300,000 $ |
| Number of seats | | 20000 | 20000 | 20000 | 20000 | 20000 |
| Increase in TV rights | | 100,000 $ | 100,000 $ | 100,000 $ | 100,000 $ | 100,000 $ |
| Increase in radio rights | | 40,000 $ | 40,000 $ | 40,000 $ | 40,000 $ | 40,000 $ |
| Increase in marketing and other products | | 200,000 $ | 200,000 $ | 200,000 $ | 200,000 $ | 200,000 $ |
| Number of additional postseason games | | 4 | 4 | 4 | 4 | 4 |
| TV rights per additional postseason games | | 250,000 $ | 250,000 $ | — $ | 250,000 $ | 250,000 $ |
| Radio rights per additional postseason games | | 50,000 $ | 50,000 $ | — $ | 50,000 $ | 50,000 $ |
| Mkg and other products per add. postseason game | | 50,000 $ | 50,000 $ | — $ | 50,000 $ | 50,000 $ |
| Player surrender value | 15,000,000 $ | 16,000,000 $ | 15,000,000 $ | 14,000,000 $ | 13,000,000 $ | 12,000,000 $ |
| Player's age | 23 | 24 | 25 | 26 | 27 | 28 |

**League value (L)**
This value would be given only as an exception to outstanding athletes generating an increase in total league revenues. This component should be supported by every team in the league. Additional revenues over the league should be considered. The league would determine the percentage of this value that would be returned to the player.

As explained above, for each component, we have to determine assumptions to be used in the actuarial formulas. These assumptions and the ensuing computations will be influenced by the following parameters.

- **Age** should be considered when evaluating contingencies risks like mortality, disability and injuries. It would have a significant impact on most of the eight components.
- **Charisma**, if applicable, could influence principally component (M) and to a lesser degree other components.
- **Complementarity**, **Chemistry**, **Leadership** and **Reliability** would influence significantly component (P) and to a lesser degree the other components.
- **Player behavior outside the rink**, **Energy** and **Resilience** would affect all components.
- **Experience** would affect mostly (P) and (D)
- **Performance** would be the most significant parameter affecting all components.
- **Injury proneness** would influence the disability assumptions.

## SALARY CALCULATION

This would be done according to the following steps:

1) **Determine the contract length.** This must be fulfilled before any salary calculation. If the team wants to test multiple durations, the model allows it by replicating the calculation using multiple durations.

2) **Determine the economic value percentage.** A decision has to be made regarding the percentage of the total economic value that the team wants to credit to the athlete. This percentage could be over 100 percent due to market considerations, but at least management would then be aware of it in its payroll management.

3) **Calculate the economic value.** This is where the model comes into play. Team management determines the assumptions and the model calculates the economic value as the sum of the first seven components. The league value component, if necessary, would be calculated separately since it would be divided between all teams.

4) **Salary calculation.** This final step is performed according to values determined in the first three steps, making sure to take into account other factors like minimum salary and any salary cap and floor constraints.

Formulas for determining the different values could be viewed while reading the original paper. A practical illustration (including main assumptions) regarding economic value and salary calculation for player X with no (L) value is included in Figures 1–3.

## CONCLUSION

This model is by no means a panacea to the problem of determining a player's salary. It is basically a tool for helping to allocate a given budget between 23 players. The key part of the whole process would still remain the responsibility of team management: determining the assumptions. The results would help the management to not only determine each player's salary, but also prepare an arbitration case and/or evaluation for a potential trade regarding a given player depending on his ratio (current salary vs. real economic value). By running different tests, it would become obvious that the economic value differs widely from one player to another and that franchise players well-deserve their actual salaries while players classified as "grinders" or "energy players" are generally overpaid. Any informed hockey fan (and certainly general managers) already suspected or knew it, but the introduction of the economic value tool would bring an actuarial light to the situation by substituting demonstrations for impressions. A

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