Appendix A: Comparison Group Salaries for Faculty Members at UWSP, Factoring in Years of Experience and Merit

The comparison salary data available from the College and University Professional Association (CUPA) does not give detail beyond the averages for a given rank and discipline. These data are crucial to making reasoned comparisons, but it does not directly inform on how to factor in years of experience and merit. To do so, we propose a model that is structurally consistent with how promotion and pay-plan increases in salary at UWSP have been calculated in the past. In determining the comparison salary to be used for an individual faculty member, the model takes into account:

i) **CUPA Data:** The CUPA data provide the comparison salary for a person of given rank and discipline whose years of experience and merit are at the average. This grounds the model into the reality of the market to which a person should be compared.

ii) **Consumer Price Index (CPI) Data:** CPI data provides a means of adjusting for the cost of living in Central Wisconsin in comparison to the nation as a whole.

iii) **The Individual’s Total Years of Experience,** and

iv) **The Individual’s Average Merit Score at UWSP.**

To understand the model, it can be helpful to think of the CUPA data as the starting point for comparison. The model adjusts the CUPA data to account for the cost of living using a single factor that is the ratio of the CPI for Central Wisconsin to the CPI for the nation. The adjusted CUPA data is then modified upward or downward to account for years of experience and merit. Solid performance and merit are weighted by 2/3 and 1/3, respectively, in accordance with past practices at UWSP. The average number of years of experience must be estimated for each rank. A single, reasonable value for each rank is used across campus. The percentage increase for a year of experience is discipline-specific, and is calculated from the CUPA data.

To show how the comparison salary of a UWSP faculty member will be calculated, we will use the rank of assistant professor as the example. The higher ranks will use formulae of nearly the same format.
Appendix A of Phase 2

\textbf{$S_{CG}$ for rank of Assistant Professor}

\[ S_{Asst}(Y) = S(0) \prod_{a=1}^{Y} \left( 1 + \frac{2}{3} r_a + \frac{1}{3} r_a M_a \right) \]

Where,

- $S_{Asst}(Y)$ is the comparison salary for an assistant professor with $Y$ years of experience. It is the number sought for this rank to use for $S_{CG}$ in Equation 1 to determine \%CI.
- $Y =$ the individual’s total years of experience, including years at UWSP and years credited at the time of hire.
- The subscript $a$ represents the years “prior” to and including year $Y$. Conceptually, $S_{Asst}(Y)$ can be thought of as having developed over time from $a=0$ to $a=Y$.
- $M_a = $ the individual’s fractional merit in year $a$. For a merit score of 14 points, $M_a = 14/14 = 1$. For 15 points, $M_a = 15/14 \approx 1.07$. For 13 points, $M_a = 13/14 \approx 0.93$.
- $r_a = $ the fractional value of a year of experience in year $a$. $r_a$ can be thought of the ideal annual rate of salary increase applied in year $a$ in the case of earning average merit (14 points, $M_a = 1$).
- The factors of $2/3$ and $1/3$ are the weighting factors for solid performance and merit, in accordance with past practices at UWSP.
- $S(0)$ is the model’s predicted, ideal starting salary for an assistant professor with zero years of experience ($Y=0$). $S(0)$ is discipline-specific. $S(0)$ is adjusted for the cost of living in Central Wisconsin, and it is a market factor that varies from discipline to discipline. It is based upon CUPA salary data for the discipline and also upon reasonable assumptions about the average $Y$ for the three ranks. The average $Y$ itself is not discipline specific.

Again, from a conceptual standpoint, $S_{Asst}(Y)$ can be thought of as having developed over time from years $a=0$ to $a=Y$. $S_{Asst}(Y)$ “starts” at $S(0)$ and each year increases by the multiplicative factor of $(1 + \frac{2}{3} r_a + \frac{1}{3} r_a M_a)$. This accurately models UWSP’s past practices in calculating pay-plan increases from year to year.

In this form, the model presents some practical complications for the purposes of Phase 2. It requires applying individual values for $r_a$ and $M_a$ in each of the multiplicative factors from $a=1$ to $a=Y$. When extending this model to the full professor with many years of experience, this is cumbersome at best and intractable at worst. The model can be simplified by realizing that $r_a$ and $r_a M_a$ will surely be small\(^1\) in practice. This allows us to estimate the multiplicative terms as a sum of terms, in other words, to approximate $S_{Asst}(Y)$ as a straight line.

\(^1\) Here, “small” is in comparison to 1. Less than 0.1 is sufficiently small for a decent approximation. $r_a = 0.1$ corresponds to a 10% annual increase, well above the reasonable value of one year of experience.
Appendix A of Phase 2

\[ \prod_{a=1}^{Y} \left( 1 + \frac{2}{3} r_a + \frac{1}{3} r_a M_a \right) \approx 1 + \sum_{a=1}^{Y} \frac{2}{3} r_a + \sum_{a=1}^{Y} \frac{1}{3} r_a M_a \]

The model can be simplified further if we approximate by using a static rate of increase over time. In other words, if we replace all values of \( r_a \) with a single, average value of \( r \), we get

\[ \prod_{a=1}^{Y} \left( 1 + \frac{2}{3} r + \frac{1}{3} r M_a \right) \approx 1 + \sum_{a=1}^{Y} \frac{2}{3} r + \sum_{a=1}^{Y} \frac{1}{3} M_a \]

Now, notice that the average merit, \( \bar{M} \), from \( a = 1 \) to \( a = Y \) is given by \( \bar{M} = \frac{1}{Y} \sum_{a=1}^{Y} M_a \), further simplifying the equation to:

\[ S_{\text{Asst}}(Y, \bar{M}) \approx S_{\text{Asst}}(0) \left( 1 + \frac{2}{3} rY + \frac{1}{3} rY \bar{M} \right) \]

To get an equation for each of the higher ranks, we simply multiply by 1.07 and 1.09 so that

\[ S_{\text{Asso}}(Y) \approx S(0)(1.07) \left( 1 + \frac{2}{3} rY + \frac{1}{3} rY \bar{M} \right) \]

\[ S_{\text{Prof}}(Y) \approx S(0)(1.07)(1.09) \left( 1 + \frac{2}{3} rY + \frac{1}{3} rY \bar{M} \right) \]

The factors of 1.07 and 1.09 represent the fact that it is established practice and policy at UWSP to apply a 7% and 9% increase to an individual’s base salary upon promotion to associate professor and full professor, respectively. Each of the equations represents the ideal comparison salary (\( S_{\text{CG}} \) from Equation 1 of the main text) for a ranked professor with \( Y \) years of experience (years at UWSP combined with any credited at the time of hire) and whose fractional merit has averaged to \( \bar{M} \) while at UWSP. The values of \( S(0) \) and \( r \) are adjusted for the cost of living and are specific to a discipline but not to a rank. Note that \( S(0) \) can be thought of as the ideal starting salary for an assistant professor in a given discipline.

**Determining \( S(0) \) and \( r \)**

In our model, “average” means having accrued the average number of years of experience for the rank and having merit scores at UWSP such that \( \bar{M} = 1 \). For the case of average merit (\( \bar{M} = 1 \)), the three equations for \( S_{\text{Rank}} \) reduce to

\[ S_{\text{Asst}}(Y, \bar{M} = 1) \approx S(0)(1 + rY) \]

\[ S_{\text{Asso}}(Y, \bar{M} = 1) \approx S(0)(1.07)(1 + rY) \]
Appendix A of Phase 2

\[ S_{\text{prof}}(Y, M = 1) \approx S(0)(1.07)(1.09)(1 + rY) \]

Notice \( S_{\text{Asst}} \) versus \( Y \) is a straight line with a slope of \( rS(0) \) and an intercept of \( S(0) \). We can use CUPA data for the three ranks to provide three data points along that line. Linear regression then provides the best fit slope and intercept for the CUPA data.

CUPA data provides the average salary nationwide for a pool of faculty in a given rank and discipline. In the case of assistant professors in a given discipline, we label that CUPA average salary as \( C_{\text{Asst}} \). If we adjust \( C_{\text{Asst}} \) for the cost of living in Central Wisconsin, then we have a market-based target salary for the “average” assistant professor in that discipline. We can do so using

\[ C^*_\text{Asst} = \left( \frac{CPI_{\text{CW}}}{CPI_{\text{US}}} \right) C_{\text{Asst}} \]

Where \( C^*_\text{Asst} \) is the market-adjusted CUPA average salary. \( CPI_{\text{CW}} \) and \( CPI_{\text{US}} \) are the Consumer Price Indices for Central Wisconsin and the U.S., respectively. Similarly, for the higher ranks:

\[ C^*_\text{Asso} = \left( \frac{CPI_{\text{CW}}}{CPI_{\text{US}}} \right) C_{\text{Asso}} \text{ and } C^*_\text{prof} = \left( \frac{CPI_{\text{CW}}}{CPI_{\text{US}}} \right) C_{\text{prof}} \]

Let \( Y_{\text{Asst}}, Y_{\text{Asso}}, \) and \( Y_{\text{Prof}} \) represent the average number of years of experience for each of the ranks. If the model is to mirror the reality of the CUPA data, then the values of \( S(0) \) and \( r \) used in the model should be set so that

\[ S_{\text{Asst}}(Y_{\text{Asst}}, M = 1) \approx C^*_\text{Asst} \]

In other words, \((Y_{\text{Asst}}, C^*_\text{Asst})\) is the first data point. The values of \( S(0) \) and \( r \) used in the model should also be set so that the trendline for \( S_{\text{Asst}} \) will nearly pass through

\[ S_{\text{Asst}}(Y_{\text{Asso}}, M = 1) \approx C^*_\text{Asso} / 1.07 \]

\[ S_{\text{Asst}}(Y_{\text{Prof}}, M = 1) \approx C^*_\text{prof} / (1.07)(1.09) \]

This provides two additional data points. We do still need values for \( Y_{\text{Rank}} \). **We recommend** \( Y_{\text{Asst}} = 4 \) years, \( Y_{\text{Asso}} = 10 \) years, and \( Y_{\text{Prof}} = 20 \) years for all disciplines. It is important to note that \( Y_{\text{Rank}} \) refers to total years of experience for a person at that rank. It does NOT represent the years at that rank.
Physics as an Example

Using $Y_{Asst} = 4$, $Y_{Asso} = 10$, $Y_{Prof} = 20$, and \( \left( \frac{CPI_{CW}}{CPI_{US}} \right) = 0.96 \), we can apply the CUPA data for the discipline of Physics to see the model in action.

- For Physics, $C_{Asst} = $55,000, $C_{Asso} = $64,000, and $C_{Prof} = $82,000.
- Adjusting for the cost of living, $C^*_{Asst} = $52,800, $C^*_{Asso} = $61,440, and $C^*_{Prof} = $78,720.
- And so the adjusted CUPA averages are: $C^*_{Asst} = $52,800, $C^*_{Asso}/(1.07) = $57,420$, and $C^*_{Prof}/[(1.07)(1.09)] = $67,500.

The adjusted CUPA averages are plotted versus the years of experience, displaying the equation for the best-fit line.

- The intercept gives a value of $S(0) \approx $48,724.
- From the slope, $r = \frac{\text{slope}}{S(0)} \approx \frac{927.86}{48724} \approx 0.0190$, or around 1.9% per year.
To show the effect of years of experience on the various ranks, below is a plot of the model’s predicted salary versus years for the three ranks assuming average merit ($\bar{M} = 1$). To show the effect of average merit over time, below also is a plot of the model’s predicted salary versus years for the rank of professor with different values of $\bar{M}$.
Appendix A of Phase 2

It must be acknowledged that it is possible in this model to get salary inversion for the ranks. This will happen if the CUPA data yields a negative value of $r$. It can be easily shown that $r = 0$ would be the result if, for instance,

\[
C^{*}_{Asso} = (1.07)C^{*}_{Asst}
\]
\[
C^{*}_{prof} = (1.07)(1.09)C^{*}_{Asst}
\]

The Phase 2 model simply collapses to the Phase 1 approach under this circumstance.

It can also be shown that $r < 0$ if, for instance,

\[
C^{*}_{Asso} < (1.07)C^{*}_{Asst}
\]
\[
C^{*}_{prof} < (1.07)(1.09)C^{*}_{Asst}
\]

This situation would correspond to a discipline where the national averages carry a level of compression that is beyond the nominal 7% and 9% promotion increases at UWSP. There are not currently any disciplines whose most recent CUPA will yield $r < 0$, but there is no guarantee that will remain true in the future. *We recommend that, in any discipline for which a negative value of $r$ is obtained from the CUPA data, the model reverts to the Phase 1 approach adjusted for cost of living, where $S_{\text{Rank}} = C^{*}_{\text{Rank}}$.***