Results

Moderation

Introduction

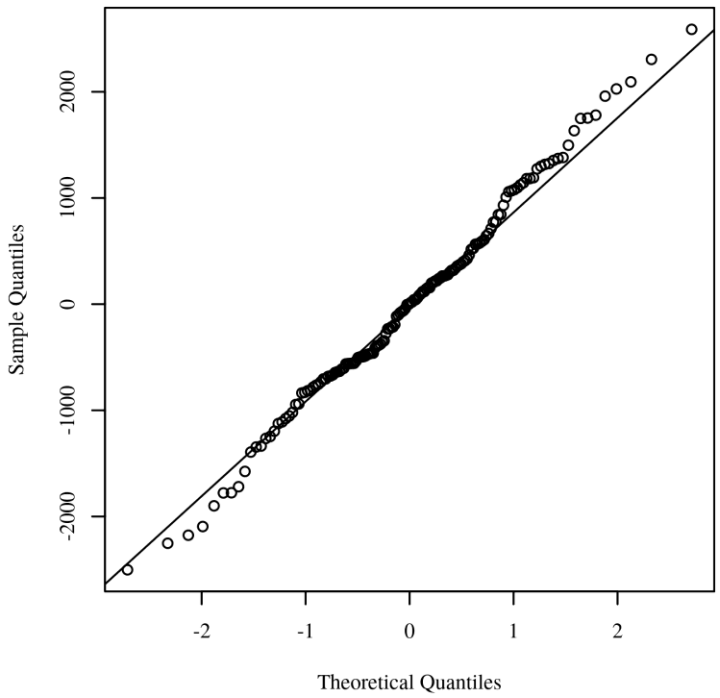
A multiple linear regression analysis was conducted to determine if Sex and Experience had a moderating effect on Salary. Mean centering was used for Experience.

Assumptions

Normality. The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a normal distribution, also called a Q-Q scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. Figure 1 presents a Q-Q scatterplot of model residuals.

Figure 1

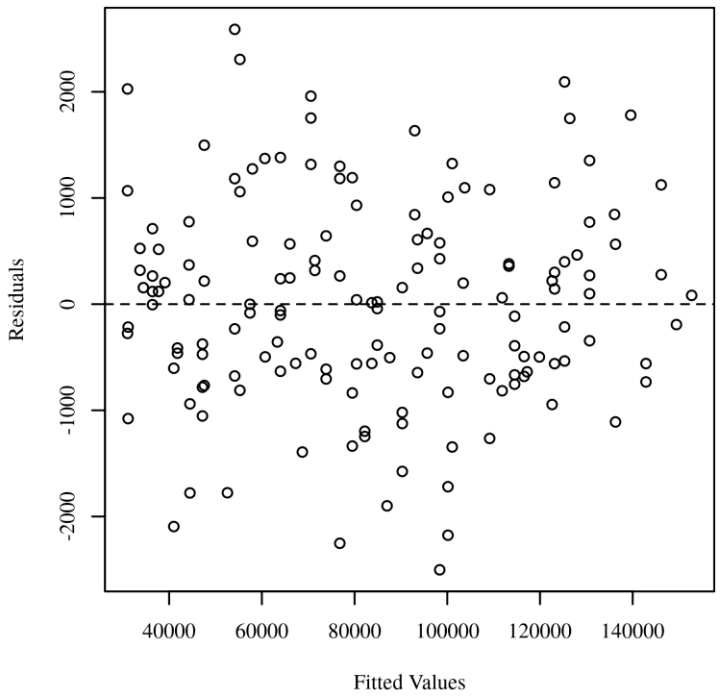
Q-Q scatterplot for normality of the residuals for the regression model.



Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. Figure 2 presents a scatterplot of predicted values and model residuals.

Figure 2

Residuals scatterplot testing homoscedasticity



Multicollinearity. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 1 presents the VIF for each predictor in the model.

Table 1

Variance Inflation Factors for Experience, Sex, and Experience:Sex

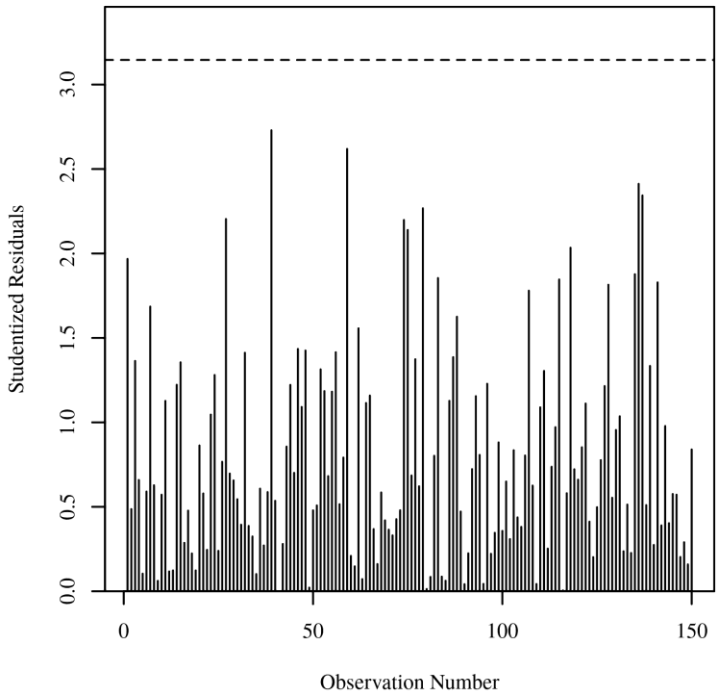
Variable	VIF
Experience	2.51
Sex	1.02
Experience:Sex	2.48

Outliers. To identify influential points, Studentized residuals were calculated and the absolute values were plotted against the observation numbers (Field, 2017; Pituch & Stevens, 2015). Studentized residuals are calculated by dividing the model residuals by the estimated residual standard deviation. An observation with a Studentized residual greater than 3.15 in

absolute value, the 0.999 quantile of a *t* distribution with 149 degrees of freedom, was considered to have significant influence on the results of the model. Figure 3 presents the Studentized residuals plot of the observations. Observation numbers are specified next to each point with a Studentized residual greater than 3.15.

Figure 3

Studentized residuals plot for outlier detection



Results

Overall model. The overall model was significant, $R^2 = 1.00$, $F(3, 146) = 55{,}703.58$, $p < .001$, indicating the predictors accounted for 99.91% of variance in Salary. Since the overall model was significant, moderation was assessed by examining the interaction between Experience and Sex. A significant interaction is considered evidence of a moderating effect when the overall model is significant (Netemeyer et al., 2001).

Interaction effects. The interaction between Experience and the Female category of Sex was significant, B = -591.89, t(146) = -40.26, p < .001, indicating that observing the Female category of Sex weakens the effect of Experience on Salary compared to the Male category.

Main effects. The main effect for Experience was significant, B = 3,285.99, t(146) = 289.77, p < .001, indicating that a one-unit increase in Experience will result in a 3,285.99 change in Salary on average when Sex is equal to the Male category.The main effect for the Female category of Sex was significant, B = -10,737.62, t(146) = -66.18, p < .001, indicating that the Female category tends to change the value of Salary by -10,737.62 on average compared to the Male category when Experience has a value of 0.

Table 2

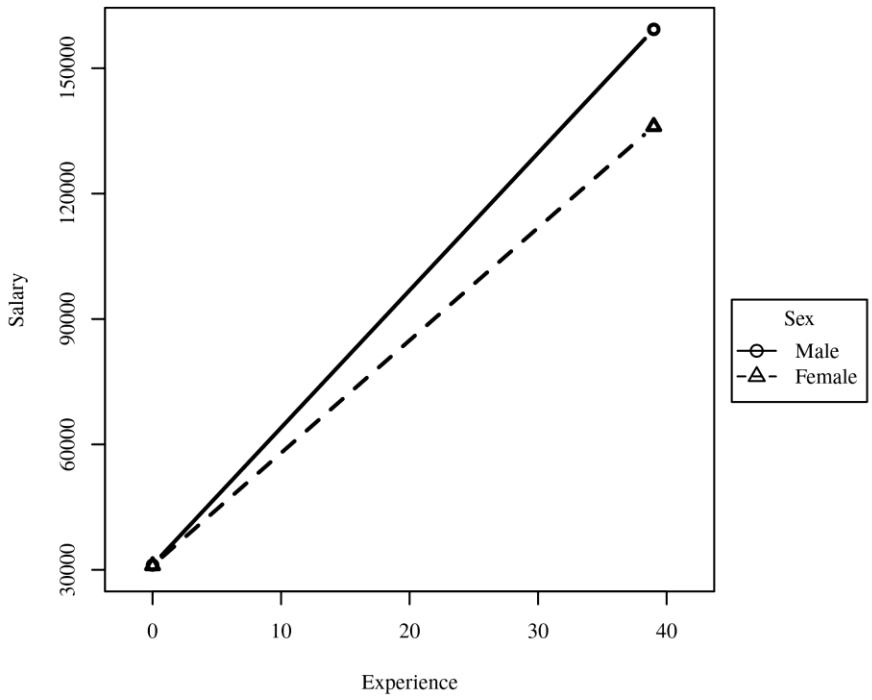
Moderation Analysis Table with Salary Predicted by Experience Moderated by Sex

Predictor	*B*	*SE*	β	*t*	*p*
(Intercept)	90,050.77	119.47	0.00	753.76	< .001
Experience	3,285.99	11.34	1.12	289.77	< .001
SexFemale	-10,737.62	162.25	-0.16	-66.18	< .001
Experience:SexFemale	-591.89	14.70	-0.16	-40.26	< .001

Moderation plot. A moderation plot was generated by plotting the regression lines for each category of Sex. The moderation plot is presented in Figure 4.

Figure 4

Regression lines for Salary predicted by Experience for each category of Sex



Simple Slopes. Simple slopes analysis was conducted to further explore the effect of Sex on the relationship between Experience and Salary. The regression coefficient for Experience was calculated while holding Sex constant at each category. The coefficient for Experience with Sex fixed to the Female category was significant, $B = 2{,}694.11$, $p < .001$. The coefficient for Experience with Sex fixed to the Male category was significant, $B = 3{,}285.99$, $p < .001$. The coefficient of Experience was at its strongest for the Male category of Sex. The coefficient of Experience was at its weakest for the Female category of Sex. The results of the simple slopes analysis are presented in Table 3.

Table 3

Simple slopes analysis for Sex moderating the relationship between Experience and Salary

Values of Sex	*B*	*SE*	% CI	*t*	*p*
Female	2,694.11	9.35	[2,675.62, 2,712.59]	288.01	< .001
Male	3,285.99	11.34	[3,263.58, 3,308.41]	289.77	< .001

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Glossaries

Moderation

Moderation is conducted in order to determine if the relationship between two variables (i.e., the independent and dependent variables) depends on a third variable. For example, the relationship between exercise frequency and weight loss may depend on age. Moderator variables strengthen or weaken the relationship between and independent and a dependent variable. Moderation occurs when the relationship between two variables is different depending on the third variable. The third variable is referred to as the moderator or moderating variable. For instance, if the relationship between exercise frequency and weight loss is different for younger people compared to older people, then age would be considered a moderator. Moderation is usually tested by conducting a multiple linear regression analysis that includes the independent variable and moderator in a model predicting the dependent variable. Additionally, a term for the interaction between the independent variable and moderator is included in the model (the interaction term is created by multiplying the independent variable with the moderator variable). Moderation is determined via the interaction term between the independent variable and moderator. If the interaction term is statistically significant, then moderation is supported. A moderation analysis carries the same assumptions as a multiple linear regression analysis, including normality, homoscedasticity, and absence of multicollinearity.

Fun Fact! *Moderation can also be assessed using analysis of variance (ANOVA) if both the independent variable and moderator are categorical.*

Degrees of Freedom (*df*): Refers to the number of values used to compute a statistic; used with the *F* to determine the *p*-value.

***F* Ratio (*F*):** Used with the two *df* values to determine the *p* value of the overall model.

Interaction Term: A predictor in the moderation analysis that is calculated by multiplying the values of the independent variable and the moderator; the interaction term represents the effect of the moderator on the relationship between the independent and dependent variables.

Multicollinearity: A state of very high intercorrelations or inter-associations among a set of variables.

Partial *F*-Test: Compares two linear regression models by their R^2 values.

***p*-value:** The probability that the null hypothesis (no interaction between the independent variable and moderator) is true.

Standard Error (*SE*): How much we expect *B* to vary.

Standardized Beta (*β*): Ranges from -1 to 1; gives the strength of the relationship between the predictor and dependent variable.

***t*-Test Statistic (*t*):** Used with the *df* to determine the *p* value of the individual predictors

Unstandardized Beta (*B*): The slope of the predictor with the dependent variable.

Variance Inflation Factors: A measurement to assess the amount of multicollinearity present in regression analysis.

Raw Output

Moderation Analysis with Salary predicted by Experience moderated by Sex

Included Variables:
Salary, Experience, and Sex

Sample Size (Complete Cases):
N = 150

Variance Inflation Factors:

Variable	VIF
Experience	2.509
Sex	1.017
Experience:Sex	2.484

Predictor	B	SE	95.00% CI	β	t	p
(Intercept)	90,050.771	119.468	[89,814.661, 90,286.881]	0.00000	753.765	5.398×10^{-264}
Experience	3,285.994	11.340	[3,263.582, 3,308.406]	1.122	289.771	2.005×10^{-203}
SexFemale	-10,737.618	162.247	[-11,058.275, -10,416.961]	-0.163	-66.180	9.070×10^{-111}
Experience:SexFemale	-591.888	14.700	[-620.940, -562.835]	-0.155	-40.264	6.081×10^{-81}

Simple Slopes Results for Sex Moderating Experience on Salary

Values of Sex	B	SE	% CI	t	p
Female	2,694.107	9.354	[2,675.619, 2,712.594]	288.007	4.882×10^{-203}
Male	3,285.994	11.340	[3,263.582, 3,308.406]	289.771	2.005×10^{-203}