

UNIX C/C++ Programmer Competitive Position® Salary Survey

Survey Dates: January 4 through December 27, 1998

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Welcome

I established Whole Root® Economic Research, Inc. in 1996 to provide extensive market analysis to individual decision makers. My Competitive Position® Salary Surveys enable individuals to assess salary opportunities and set employment goals. It is the first affordable salary survey designed specifically to assist all participants in the job marketplace. Whether you are a computer professional, information technology manager or human resource professional, I hope you find this material useful.

Thank you,

A handwritten signature in black ink, appearing to read "R. G. Vivona". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

Robert Gerald Vivona

Phone/Fax: 1-888-413-1792
bob@wholeroot.com

A Special Thanks to:

Nicholas Vivona
Computer Industry Expert

Graph Reference: Expected Salary Offer per Year of Experience

The Middle Black Line

This line depicts the expected salary offer for each year of required experience calculated from the sample of want ads.

The expected salary for each year of required experience is shown in a box on the line.

The expected salary is the most likely, and the average, salary offered.

The 95% Probability Lines Infer the Expected Salary Offer for the Entire Job Market

The sample of classified want ads enables inferences to be made concerning the entire job market for this position.

The gray lines above and below the middle black line present the Highest and Lowest salary offers that can be expected in the entire job market.

There is a 95% certainty that the average salary offer, within the entire job market for this position, lies between the High and the Low numbers that point to the gray lines at each year of required experience.

Please Note:

All three curves cross at the central tendency point.

The further the number of years of required experience is from the central tendency point, the larger the 95% probability region of the expected salary offer.

Graph Reference: Extreme Salary Offers

There are 3 statistics presented in this graph

Each statistic presents an assessment of the likelihood or frequency of a salary offer occurring:

= **Expected Salary Offer**

The expected salary offer is the most likely salary offer as calculated from the sample of want ads

68% of Want Ads list a Salary between these two Extremes (+/- 1 standard deviation)

The 68% probability extreme indicates the boundaries where salary offers become infrequent for the entire job market

95% of Want Ads list a Salary between these two Extremes (+/- 1.96 standard deviations)

The 95% probability extreme indicates the boundaries where salary offers become extremely infrequent for the entire job market

Extreme Salaries

The 68% Probability Extremes:

Salary offers are unlikely above or below this range

Two Thirds (68%) of salary offers are in this range

Only 1/6th (16%) of salary offers are greater than the high number

Only 1/6th (16%) of salary offers are less than the low number

The 68% confidence interval is constructed by taking one standard deviation then adding it to and subtracting it from the expected salary offer

The 95% Probability Extremes

Salary offers are extremely unlikely above or below this range

95% of salary offers are in this range

Only 2.5% of salary offers are greater than the high number

Only 2.5% of salary offers are less than the low number

The 95% confidence interval is constructed by multiplying the standard deviation by 1.96 then adding it to and subtracting it from the expected salary offer

For the complete presentation of the expected salary offer please see the "Expected Salary Offer per Year of Experience" graph.

Geographic Salary Adjustment Reference

The Canada adjustments convert New York City area salary offers in US\$ into regional equivalents in Can\$.

The Map

The number “.xx” in each box indicates the average percentage of a salary offer listed in a want ad in the New York City Metropolitan Area that can be expected in another geographic area, “.xx” is equivalent to “xx%”. For a regional adjustment, multiply the salary offered in a Competitive Position® Salary Survey by the number “.xx”.

The Table

The “Expected” geographic salary adjustment is the most likely adjustment based on the sample of want ads. There is a 95% certainty that the geographic salary adjustment, within the entire computer and programmer job market, lies between the “95% Low” and the “95% High” numbers.

The 95% confidence interval of the geographic salary adjustment should be used with the 95% confidence interval of the salary offer statistics from the Competitive Position® Salary Survey job titles. Multiply the “95% Low” geographic adjustment to the 95% High extreme salary offer from the “Expected Salary Offer” graph. Multiply the “95% High” geographic adjustment to the 95% Low extreme salary offer from the “Expected Salary Offer” graph. This will create the minimum 95% confidence interval for your region, qualifications and years of experience.

Methodology

The geographic salary adjustment multipliers are calculated as the ratio of the mean salary offers from each geographic region relative to the New York City region. The mean salary offer and its 95% confidence interval (± 1.96 times the standard deviation of the mean) were derived for each geographic area. The geographic adjustment multipliers were calculated as the ratio of the means, 95% lower bounds and 95% upper bounds of each geographic region relative to the New York City region.

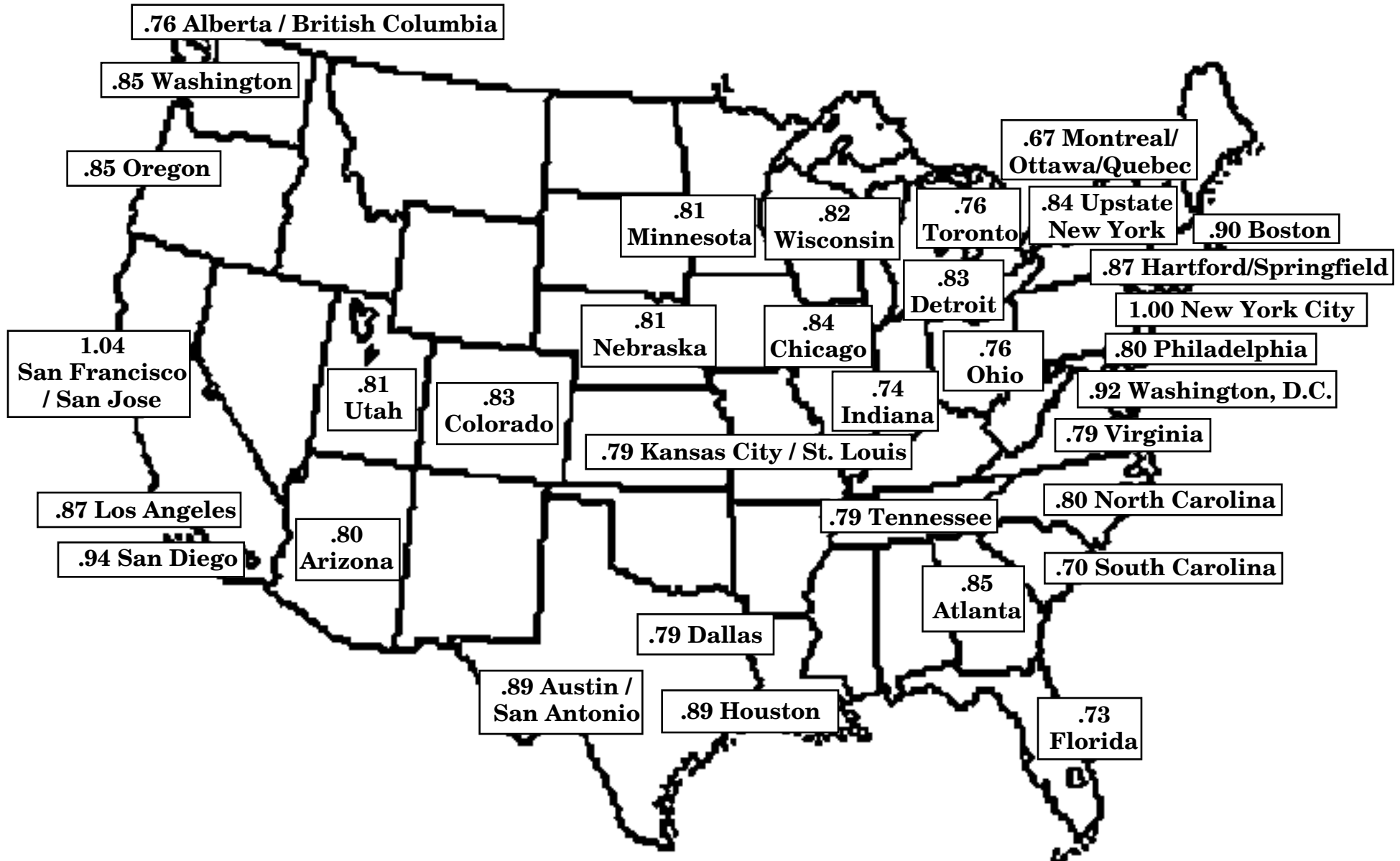
For the United States, want ads posted to the internet newsgroup “comp.jobs.offered” from April 5 through May 3, 1999 were surveyed. For Canada, want ads posted to the internet newsgroup “can.jobs” from May 7 through May 13, 1999 were surveyed. Please browse the newsgroups to familiarize yourself with the data sources. To be included in the geographic salary survey, a want ad had to list a salary offer, a geographic region and a skill that was included in the 1998 Competitive Position® IT Salary Survey of want ads listed in the New York Times. The Mean U.S.A. Salary Offer is \$69.7K and lies within the 95% probability region of the Mean Salary Offer of the 1998 Competitive Position® IT Salary Survey of want ads listed in the New York Times.

Region	# of Want Ads	Region	# of Want Ads
Arizona	82	New York City	162
Atlanta	113	New York, Upstate	110
Austin / San Antonio	128	North Carolina	245
Boston	246	Ohio	109
Chicago	97	Oregon	76
Colorado	98	Philadelphia	257
Dallas	142	San Diego	78
Florida	230	San Francisco / San Jose	80
Hartford / Springfield	90	South Carolina	44
Houston	102	Tennessee	93
Indiana	118	Utah	48
Kansas City / St. Louis	89	Virginia	81
Los Angeles	365	Washington (State)	106
Michigan	72	Washington, D.C.	112
Minnesota	93	Wisconsin	125
Nebraska	77	US Total	3,871
Alberta / British Columbia	105	Toronto	425
Montreal / Ottawa / Quebec	79	Canada Total	609

Boston includes Worcester and Southern New Hampshire. Dallas includes Fort Worth. Hartford/Springfield includes New Haven. Los Angeles includes Santa Barbara. New York City includes Northern New Jersey, Southern Connecticut and Nassau, Westchester and Rockland counties in New York. Philadelphia includes Central and Southern New Jersey and Wilmington, DE. Virginia does not include Northern Virginia. Washington, D.C. includes Northern Virginia and Montgomery and Prince Georges counties in Maryland.

April 1999 Geographic Adjustments for IT Professionals

Regional Multipliers Relative to the New York City Metropolitan Area



The number “.xx” in each box indicates the average percentage of a salary offer listed in a want ad in the New York City Metropolitan Area that can be expected in another geographic area, “.xx” is equivalent to “xx%”. To adjust for your local region, multiply the salary offered in a Competitive Position® Salary Survey job title by the number “.xx”.

Table of April 1999 Geographic Adjustments for IT Professionals

Regional Multipliers Relative to New York City Metropolitan Area

The “Expected” geographic salary adjustment is the most likely adjustment based on the sample of want ads. There is a 95% certainty that the geographic salary adjustment, within the entire IT job market, lies between the “95% Low” and the “95% High” numbers.

Region	95% Low	Expected	95% High	Region	95% Low	Expected	95% High
Alberta / British Columbia	75.5%	76.4%	77.2%	Nebraska	80.6%	81.5%	82.2%
Arizona	78.1%	79.7%	81.2%	New York City	100.0%	100.0%	100.0%
Atlanta	83.4%	84.6%	85.7%	New York, Upstate	83.4%	83.7%	84.1%
Austin / San Antonio	88.3%	88.6%	88.8%	North Carolina	79.8%	80.2%	80.6%
Boston	90.1%	90.3%	90.5%	Ohio	75.3%	76.3%	77.4%
Chicago	83.0%	83.6%	84.3%	Oregon	84.5%	84.7%	84.8%
Colorado	81.8%	82.8%	83.7%	Philadelphia	79.9%	80.0%	80.2%
Dallas	77.8%	79.3%	80.7%	San Diego	92.8%	94.1%	95.3%
Florida	73.0%	73.0%	73.1%	San Francisco / San Jose	103.4%	104.5%	105.4%
Hartford / Springfield	86.7%	87.5%	88.2%	South Carolina	68.9%	70.4%	71.8%
Houston	88.7%	89.3%	90.0%	Tennessee	78.8%	79.5%	80.1%
Indiana	73.0%	73.7%	74.4%	Toronto	75.5%	75.9%	76.3%
Kansas City / St. Louis	77.9%	78.9%	79.8%	Utah	78.4%	81.4%	84.2%
Los Angeles	87.0%	87.3%	87.7%	Virginia	77.3%	78.5%	79.7%
Minnesota	80.2%	81.3%	82.4%	Washington (State)	85.3%	85.3%	85.3%
Michigan	81.2%	82.6%	83.9%	Washington, D.C.	92.4%	92.5%	92.5%
Montreal / Ottawa / Quebec	65.1%	67.2%	69.2%	Wisconsin	81.4%	81.6%	81.9%

UNIX C/C++ Programmer

Characteristics of Sample Data

Sample Source: The **New York Times** Sunday Employment section

Dates: The 52 weeks (1 Year) from January 4 through December 27, 1998

Number of Classified Want Ads: 57

Qualifications Listed in the Want Ads

Type of Qualification	To be Included Each Want Ad Must Have	Salary Influenced When Listed = #Ads	Salary Not Influenced when Listed = #Ads
Responsibility	Designer, Developer, Programmer, Programmer/Analyst, Software Engineer or Web Developer	Project Leader or Project Manager = 7	
Hardware / OS	UNIX		
Language	C and C++		
Database			
Network			TCP/IP = 15
Software			
Industry			Finance = 23

Job Description

- Translates user requirements into design specifications for a new application, or, to reengineer and enhance existing applications
- Codes application modules based on a design document
- Integrates, Tests, Debugs and Implements application modules and documents the results

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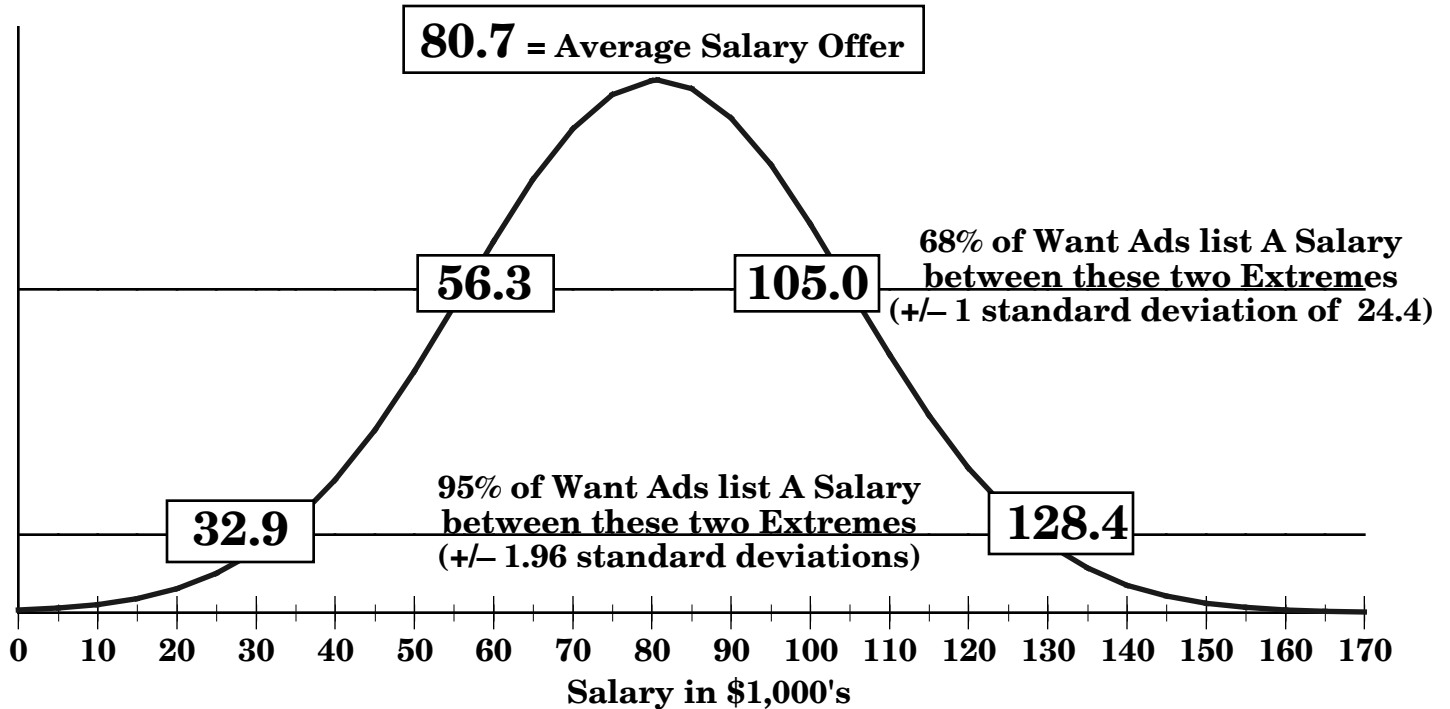
Sample Averages and Distributions

Sample Size: 57 Want Ads

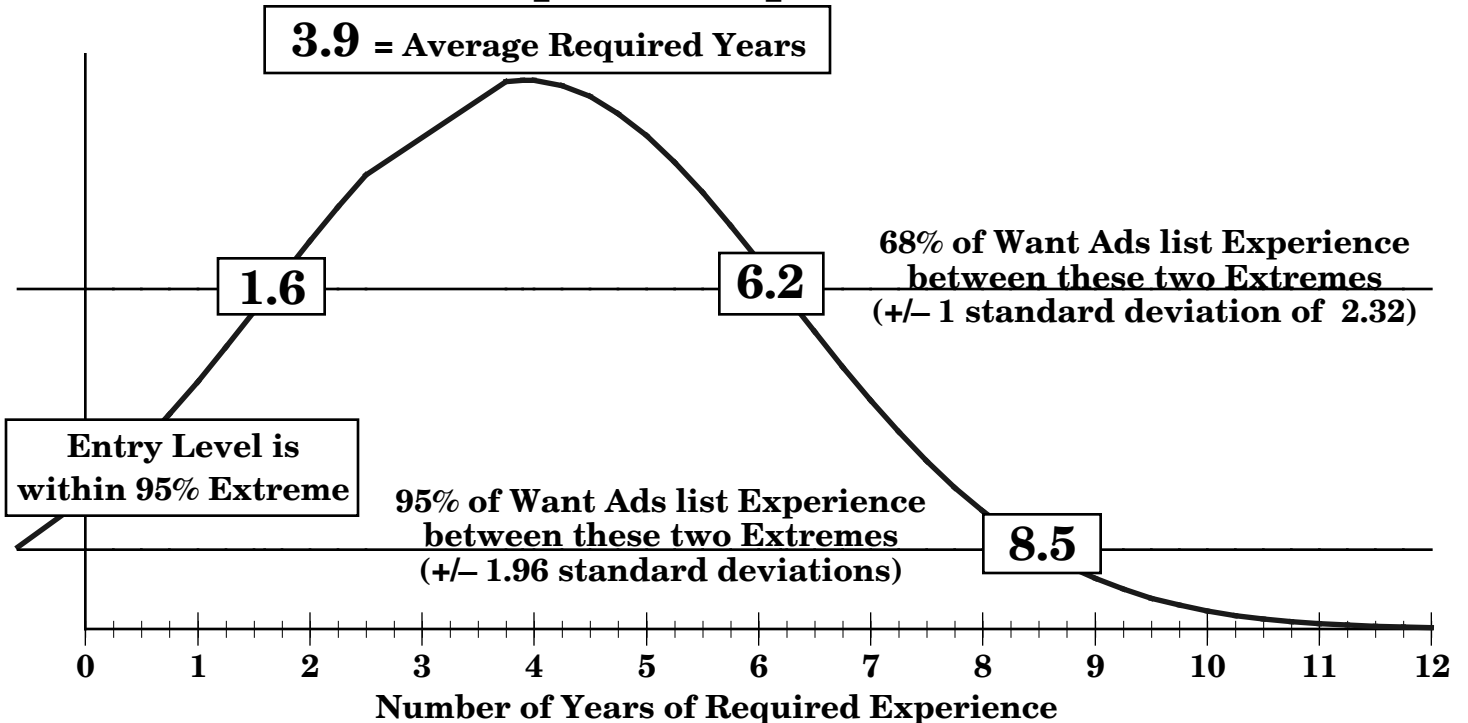
Sample Source: The New York Times Sunday Employment section

52 Weeks from January 4 through December 27, 1998

Salary



Required Experience



UNIX C/C++ Programmer

Equation of The Expected Salary Offer

Salary offers are lowest at entry level and increase by a constant amount with each year of experience.

Entry Level

Years of Experience
Dollars per Year Multiplied by
Number of Years

Expected Salary Offer	\$55.2	+	(\$5.8	*	Years)
First 95% Confidence Bound of Expected Salary Offer	\$64.0	+	(\$3.1	*	Years)
Second 95% Confidence Bound of Expected Salary Offer	\$46.3	+	(\$8.4	*	Years)

The Expected Salary Offer Graphs present the minimum confidence interval of the equation.

Extra Qualification Salary Offer Augmentation	Expected Augmentation in Salary Offer	Highest Augmentation in Salary Offer with 95% Probability	Lowest Augmentation in Salary Offer with 95% Probability
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Add to the Equation of the Expected Salary Offer

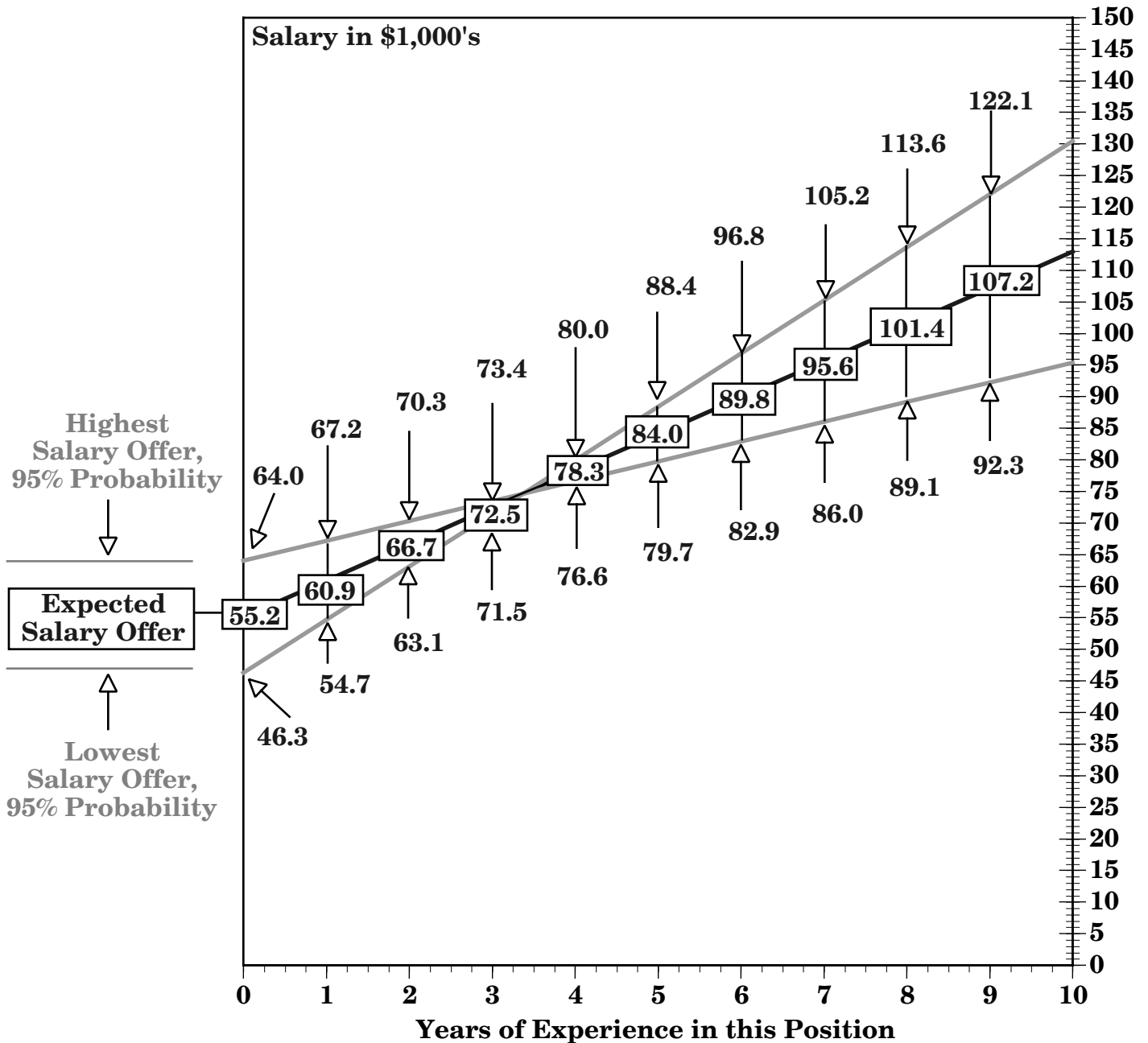
Lead UNIX C/C++ Programmer	\$22.1	\$39.7	\$4.5
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The Expected Salary Offer Graphs present the minimum confidence interval of the equation.

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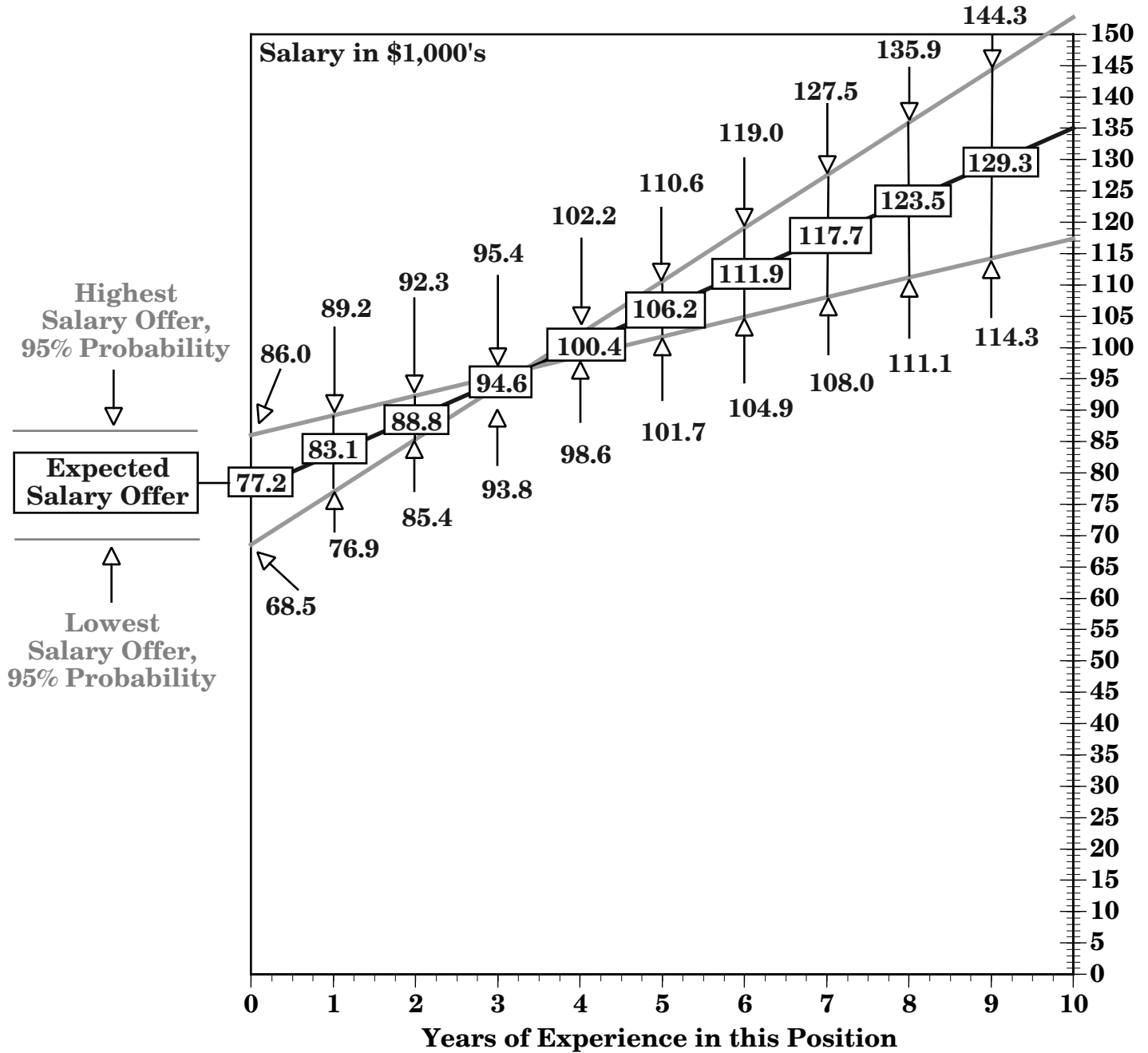
Expected Salary Offer for Each Year of Required Experience



Sample Source: The New York Times
 Sunday Employment section 52 Weeks from
 January 4 through December 27, 1998

Lead UNIX C/C++ Programmer

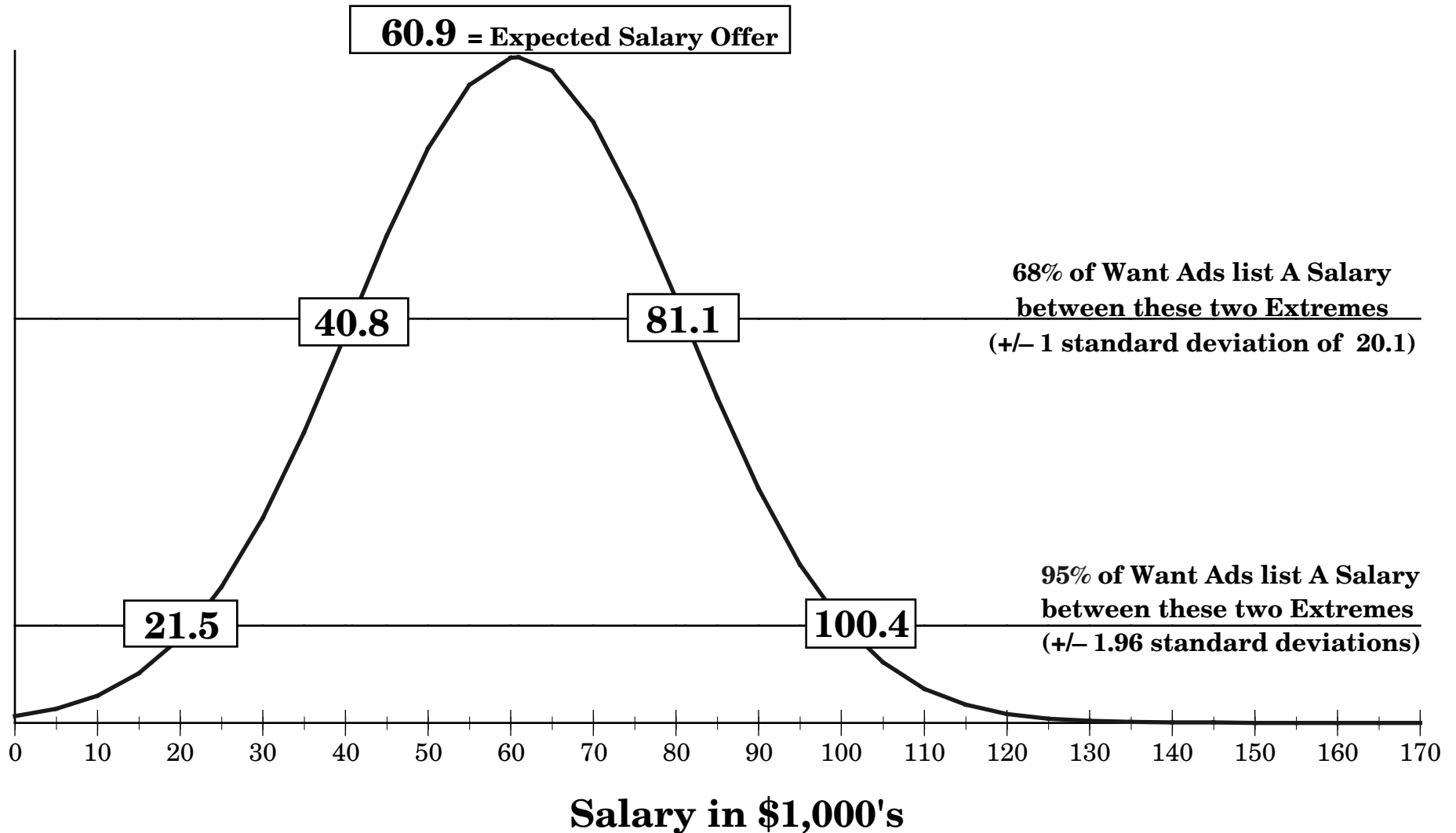
The Expected Salary Offer for Each Year of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

UNIX C/C++ Programmer

Extreme Salary Offers: 1 Year of Required Experience

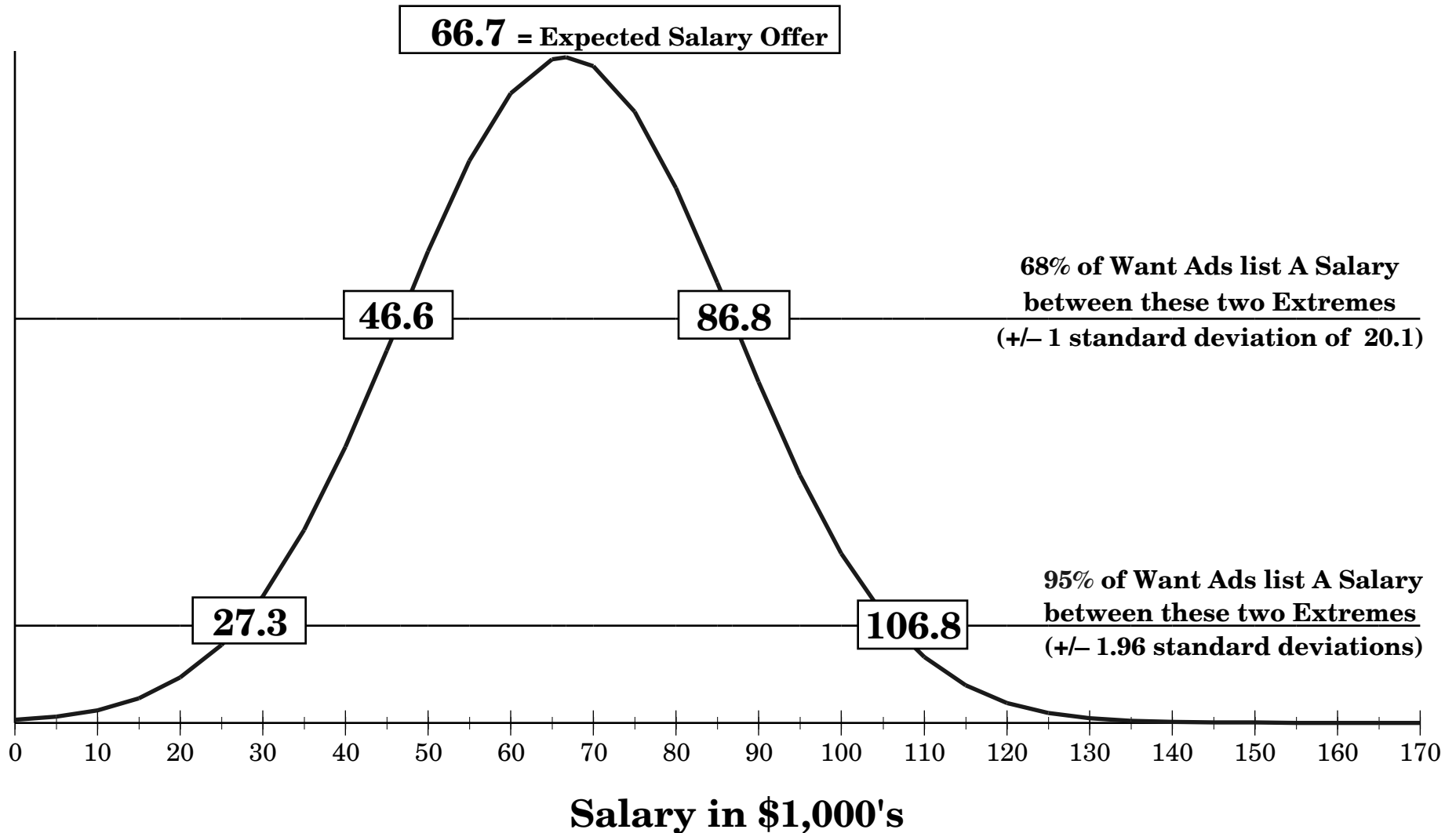


Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

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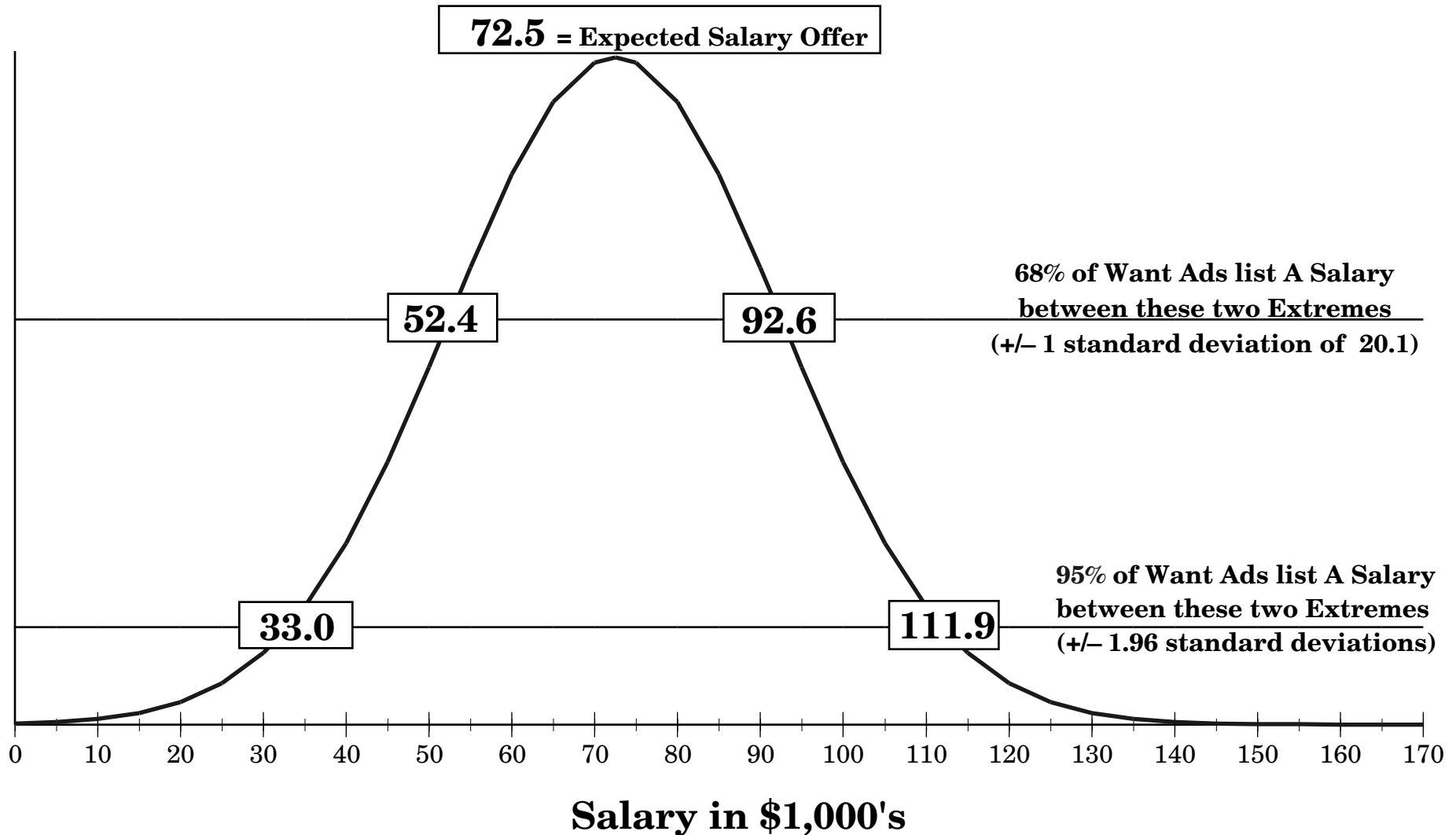
Extreme Salary Offers: 2 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

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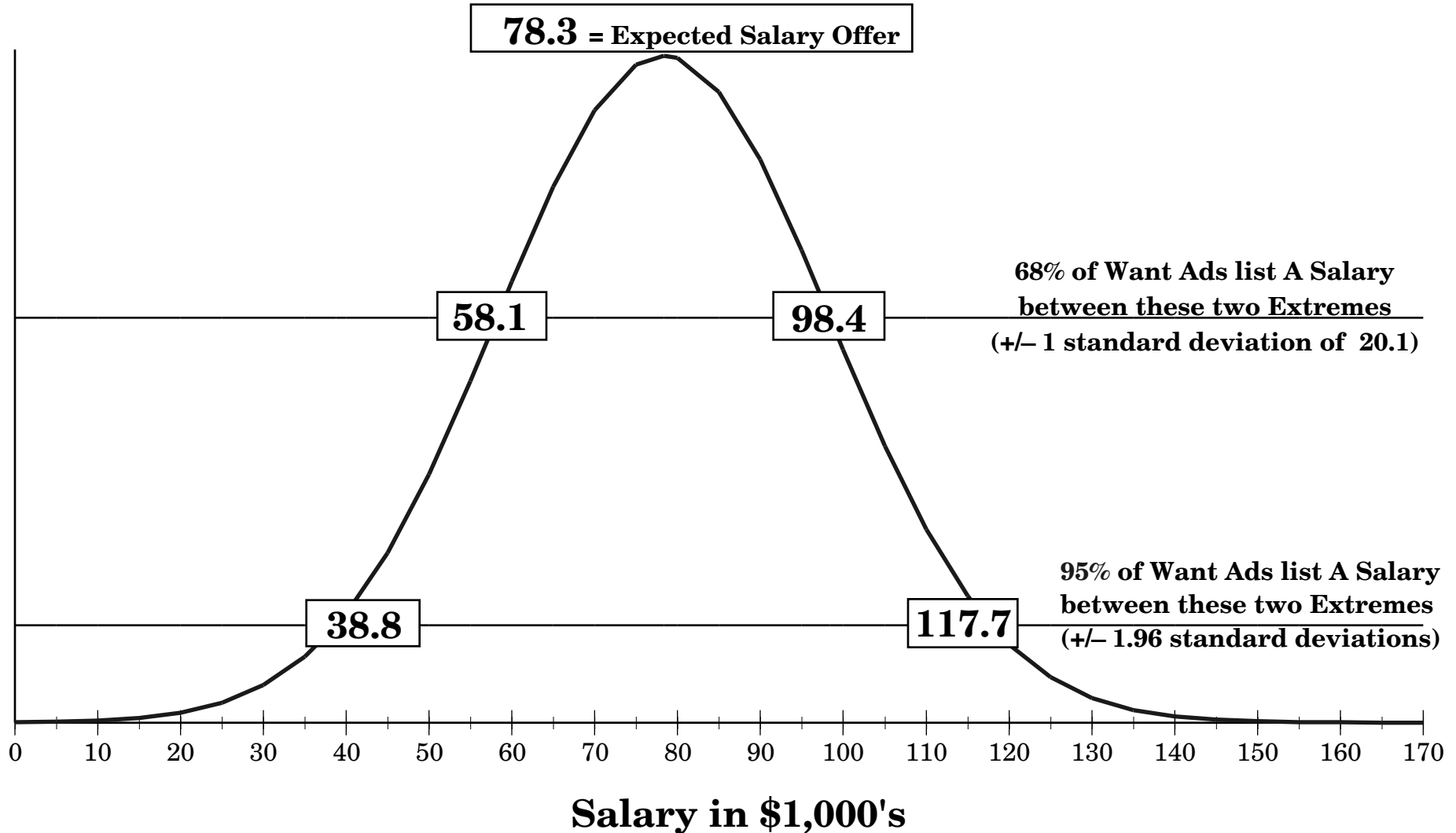
Extreme Salary Offers: 3 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

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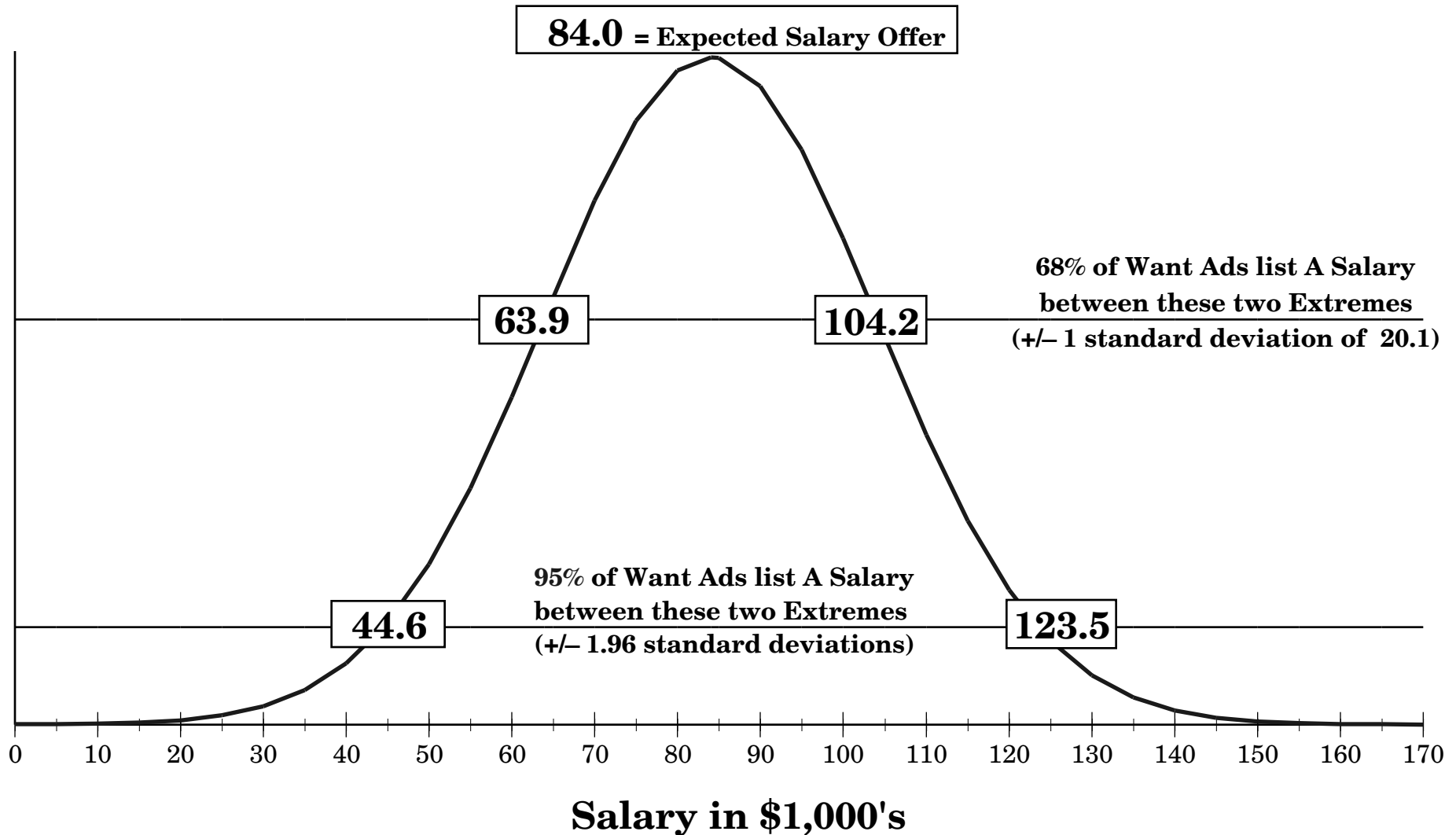
Extreme Salary Offers: 4 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

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Extreme Salary Offers: 5 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 4 through December 27, 1998

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Statistical Test Results

Final Test Result

Regression Summary
Salary H-Adj vs. 3 Independents

Count	57
Num. Missing	0
R	.971
R Squared	.943
Adjusted R Squared	.940
RMS Residual	1.907

Original Test Result

Regression Summary
Salary vs. 2 Independents

Count	57
Num. Missing	0
R	.585
R Squared	.342
Adjusted R Squared	.318
RMS Residual	20.127

The R Squared statistic indicates:

1. 34.2% of the variability between salaries offered in want ads is explained by the expected salary offer line.
2. 65.8% of the variability between salaries offered in want ads is explained in the areas above and below the average salary offer line. This variability is depicted in the 95% probability ranges in the Expected Salary Offer and the Extreme Salary Offer Graphs.

The R Squared statistic calculates the percentage of the variation in salary offers around the mean salary offer that is explained by the expected salary offer line. An R Squared statistic of '1' would indicate that the expected salary offer line would be the only salary offered in the marketplace. A reasonable degree of variability should be expected due to the many factors influencing individual want ads.

The expected salary offer line was corrected for heteroscedasticity (please view the Heteroscedasticity Correction page for specifics). A consequence of correctly accounting for the relationship within the variance is that the Final R Squared statistic is no longer accurate. The variation around the mean salary offer has been altered to correctly calculate the expected salary offer line with all available information. The Original R Squared statistic presents the percentage of variation around the mean explained by the original expected salary offer line.

ANOVA Table

Salary H-Adj vs. 3 Independents	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	3	3265.394	1088.465	299.185	<.0001
Residual	54	196.457	3.638		
Total	57	3461.851			

Regression Coefficients

Salary H-Adj vs. 3 Independents	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Entry Level H-Adj	55.157	4.428	.747	12.457	<.0001
Lead H-Adj	22.117	8.794	.297	2.515	.0149
Years H-Adj	5.778	1.317	.301	4.388	<.0001

The statistical tests indicate a high level of quality for the Expected Salary Offer line:

1. The probability, P-Value, that there is no Expected Salary Offer line, in the ANOVA Table, is less than .01% (one ten-thousandth of a percent).
2. The probability, P-Value, that a variable, in the Regression Coefficients table, has no influence on the expected salary offer is:
 - a. less than .01% (one ten-thousandth of a percent) for the Entry Level salary
 - b. 1.49% for Lead
 - c. less than .01% (one ten-thousandth of a percent) for the Years of Experience.

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Heteroscedasticity Correction

Dependent Variable = $\ln(\text{Residual}^2)$

Independent Variable(s) = $\ln(\text{Years})$

The variation in salary offers above and below the expected salary line increases at a decreasing rate as the years of experience increase.

This additional information is factored into the analysis by dividing all columns by:

$$(e^{(3.733 + .845\ln(\text{Years}))})^{.5}$$

When each want ad is weighted by its dependent influence on the variance, an unbiased expected salary offer line with constant variance is derived.

Regression Summary

$\ln(\text{Residual}^2)$ vs. 1 Independents

Count	57
Num. Missing	0
R	.294
R Squared	.086
Adjusted R Squared	.070
RMS Residual	1.756

ANOVA Table

$\ln(\text{Residual}^2)$ vs. 1 Independents

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	16.036	16.036	5.203	.0264
Residual	55	169.513	3.082		
Total	56	185.549			

Regression Coefficients

$\ln(\text{Residual}^2)$ vs. 1 Independents

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	3.733	.499	3.733	7.476	<.0001
$\ln(\text{Years})$.845	.371	.294	2.281	.0264

Original Regression Test Results with Heteroscedasticity

Regression Summary

Salary vs. 2 Independents

Count	57
Num. Missing	0
R	.585
R Squared	.342
Adjusted R Squared	.318
RMS Residual	20.127

ANOVA Table

Salary vs. 2 Independents

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	2	11366.121	5683.060	14.030	<.0001
Residual	54	21874.140	405.077		
Total	56	33240.260			

Regression Coefficients

Salary vs. 2 Independents

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	56.946	5.331	56.946	10.683	<.0001
Lead	17.052	8.136	.232	2.096	.0408
Years	5.500	1.162	.524	4.735	<.0001

Confidence Intervals

Salary vs. 2 Independents

	Coefficient	95% Lower	95% Upper
Intercept	56.946	46.259	67.633
Lead	17.052	.740	33.363
Years	5.500	3.172	7.829