

C/C++ and Visual Basic Programmer Competitive Position™ Market Report

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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™ Market Reports enable individuals to assess salary opportunities and set employment goals. It is the first affordable market analysis designed specifically to assist all participants in the job marketplace. Whether you are a computer professional, data processing manager or human resource professional, I hope you find this material useful.

Thank you,

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A Special Thanks to:

Nicholas Vivona
Computer Industry Consultant

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Characteristics of Sample Data

Sample Source: The **New York Times** Sunday Employment section
 Dates: the 52 weeks (1 Year) from January 5 through December 28, 1997

Number of Classified Want Ads: 70

Qualifications listed in the Want Ads

	To be Included Each Want Ad Must Have	Salary Effectd When Listed	Salary Not Effectd when Listed
Responsibility	Programmer, Programmer/Analyst, Analyst, Systems Analyst, Software Engineer or Designer/Developer		
Hardware / OS			
Language	C, C++ or Visual C++ & Visual Basic	Java = 11	C++ & Visual Basic = 34 Visual C++ & Visual Basic = 14
Database			Oracle, Sybase, SQL Server or Informix = 43
Network			
MIS Software			
Industry			Banking, Investment Banking, Financial, Wall Street, Insurance or Accounting = 16

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

C/C++ & Visual Basic Programmer Sample Averages and Distributions

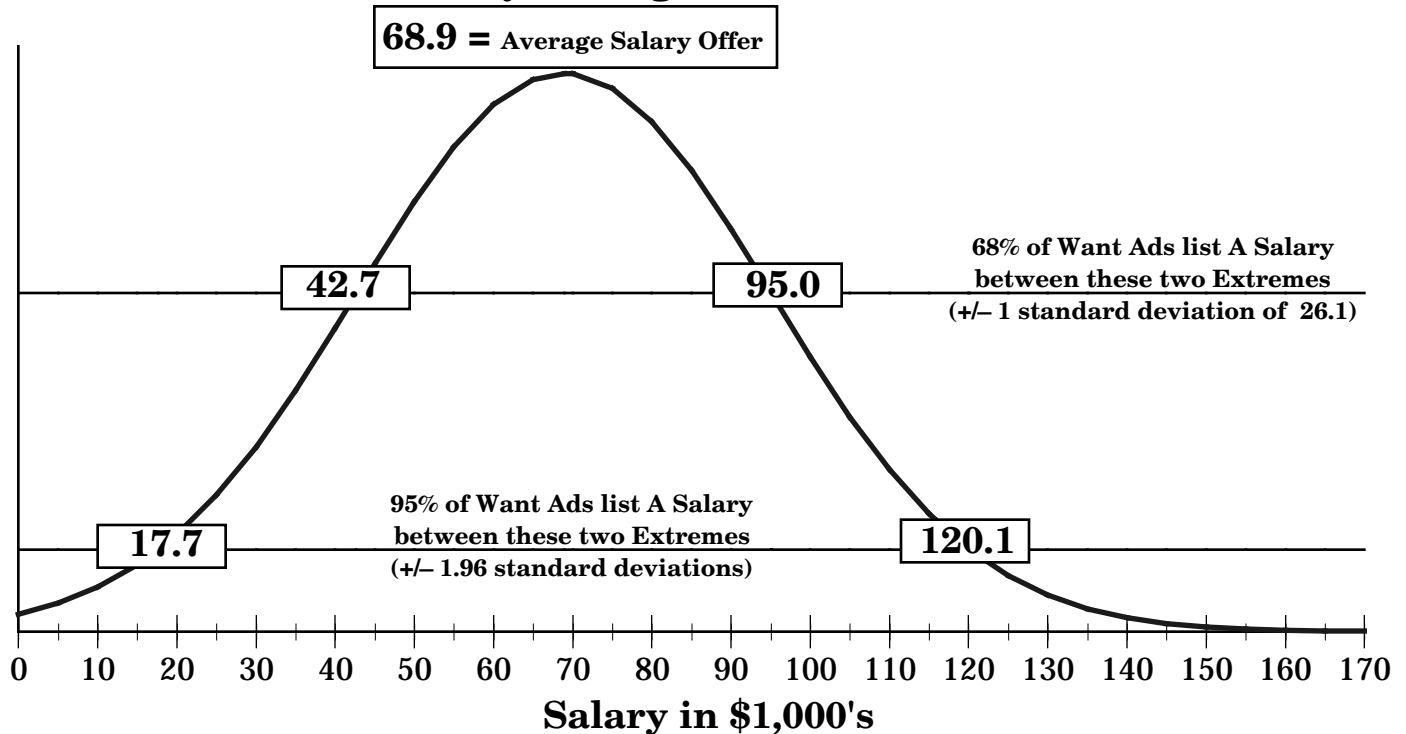
Sample Size: 70 Want Ads

Sample Source: The New York Times

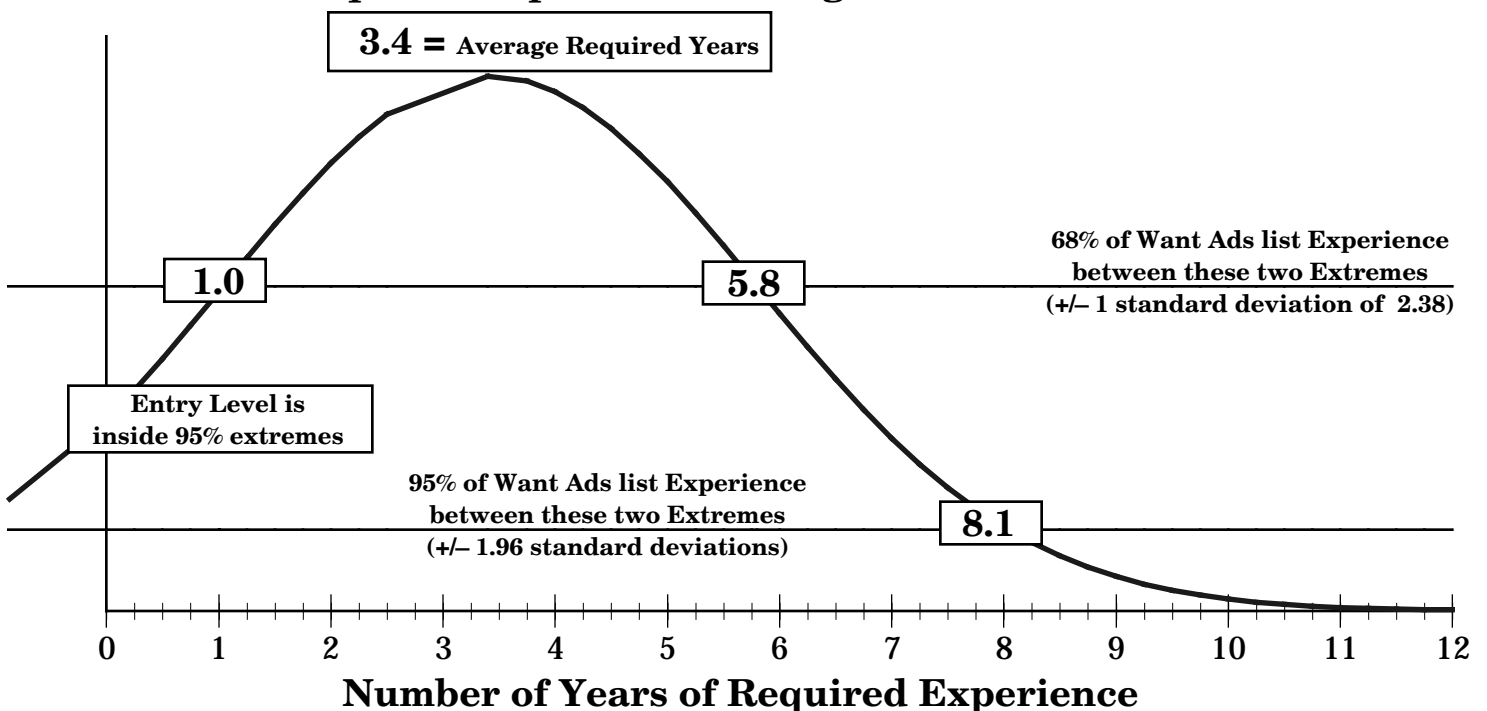
Sunday Employment section 52 Weeks from

January 5 through December 28, 1997

Salary Average and Distribution



Required Experience Average and Distribution



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The Equation of the Expected Salary Offer

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

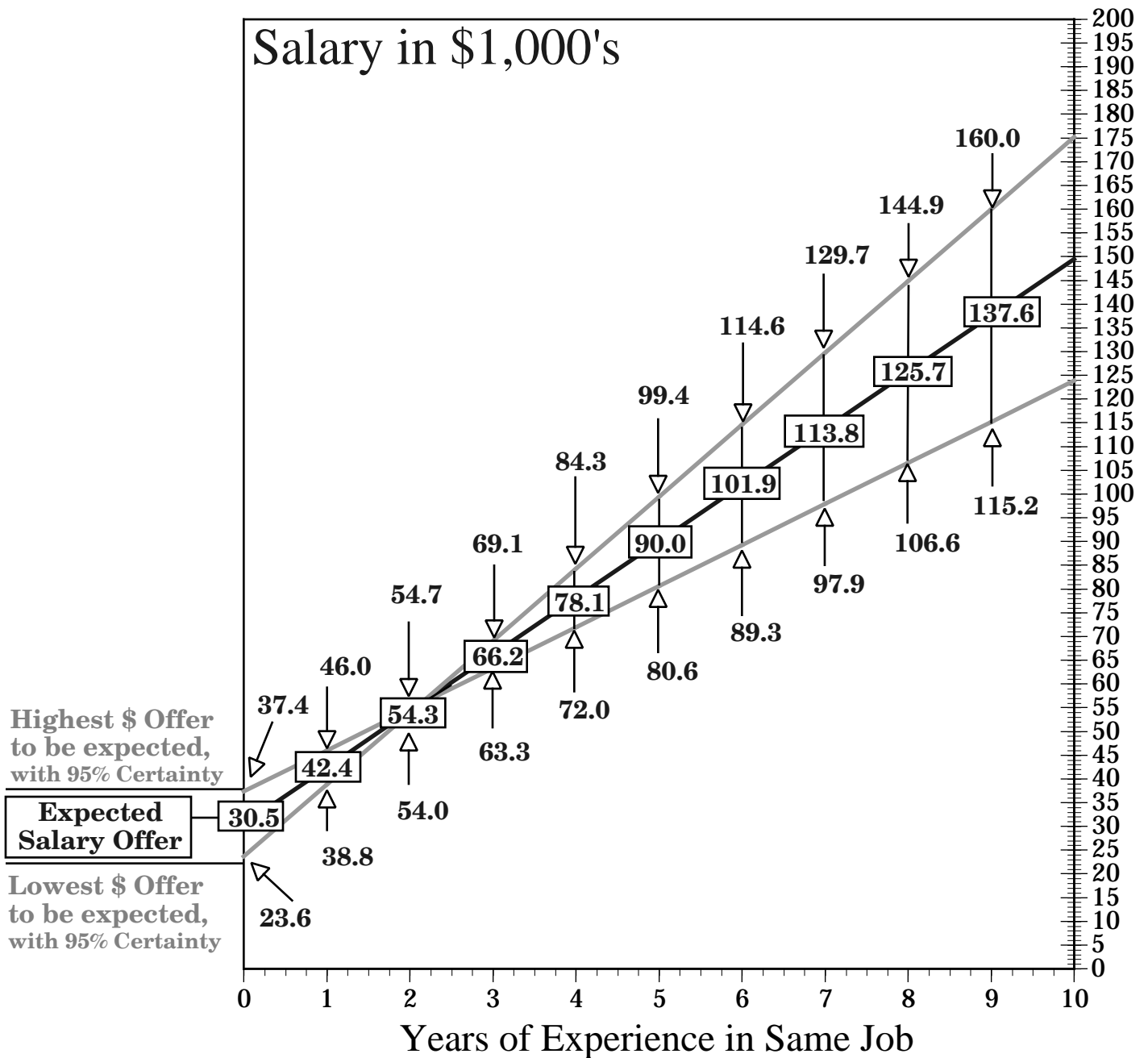
Salary offers were larger when Java was listed in the want ad.

		Entry Level		Java		Year of Experience
				Effect on Salary Offer only when listed in position description		Dollars per Year Multiplied by Number of Years
Expected Salary Offer	=	\$30.5	+	\$11.9 (if Java) or 0	+	\$11.9 Years
First 95% Confidence Bound of Expected Salary Offer	=	\$37.4	+	\$.249 (if Java) or 0	+	\$8.6 Years
Second 95% Confidence Bound of Expected Salary Offer	=	\$23.6	+	\$23.6 (if Java) or 0	+	\$15.2 Years

The first and second bounds are constructed from the upper and lower 95% confidence intervals of the variables presented above. The Expected Salary Offer Graphs present the minimum confidence interval of the equation.

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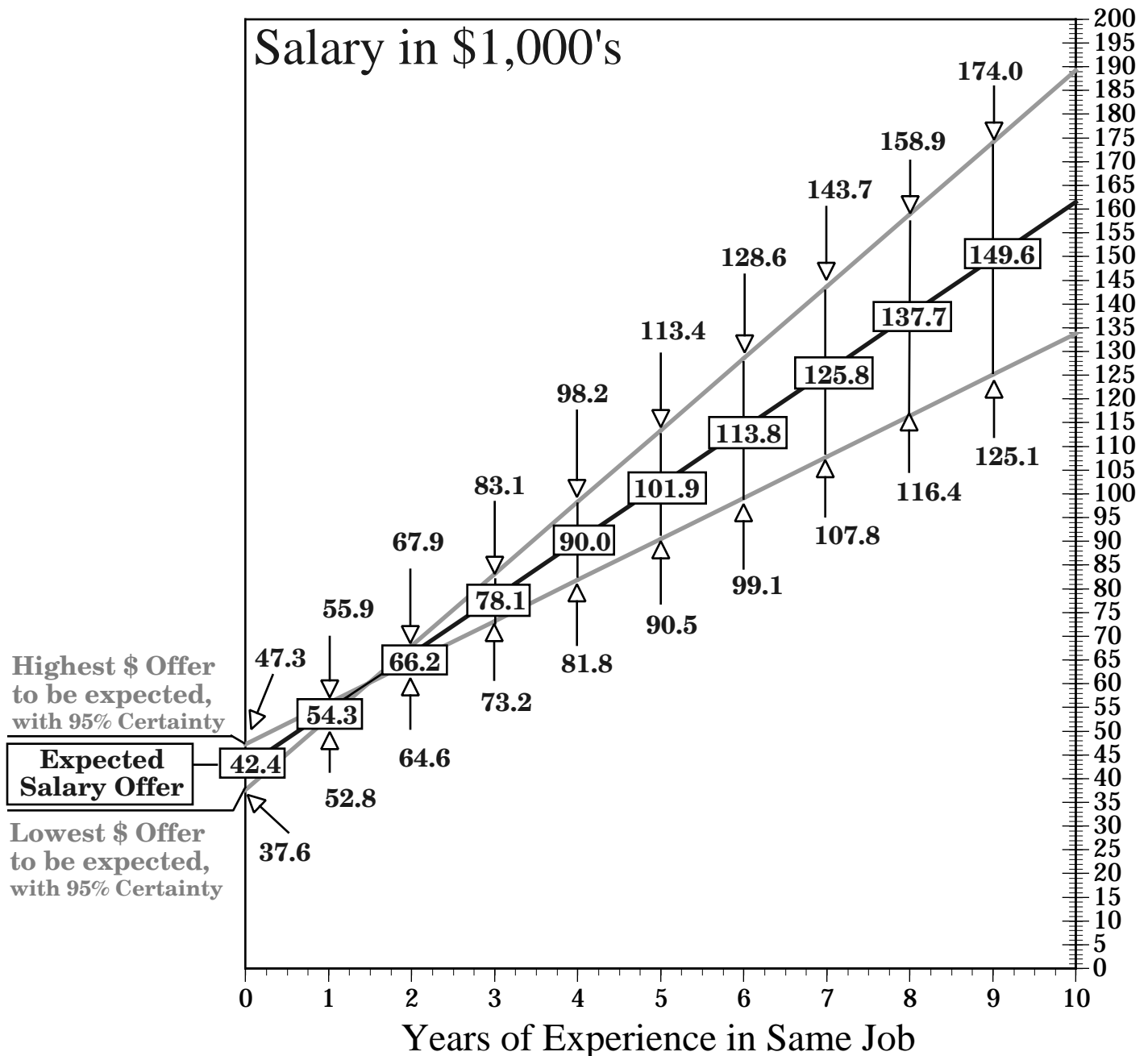
The Expected Salary Offer
& its 95% Probability Range
for Each Year of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997

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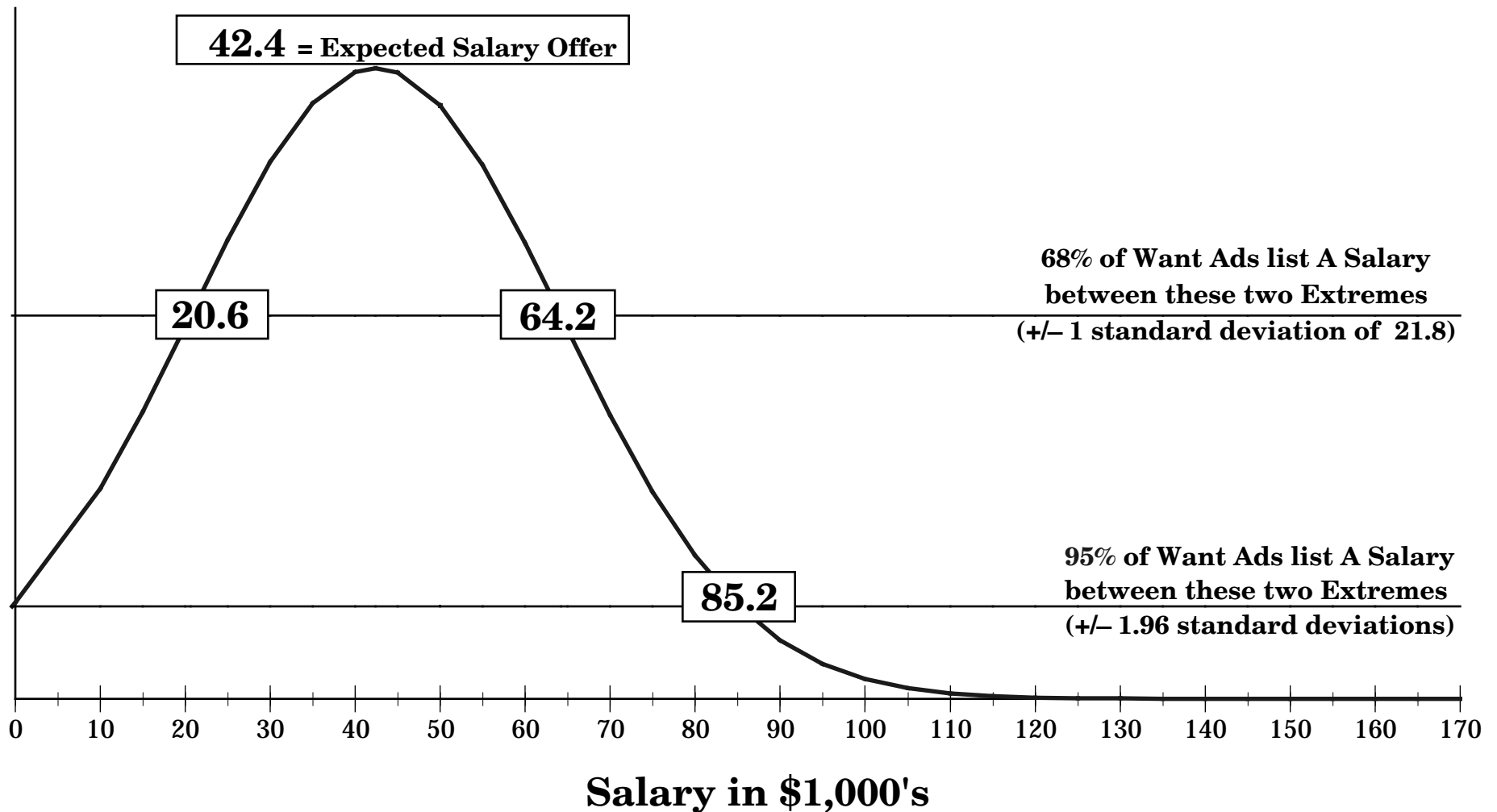
The Expected Salary Offer
& its 95% Probability Range
for Each Year of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997

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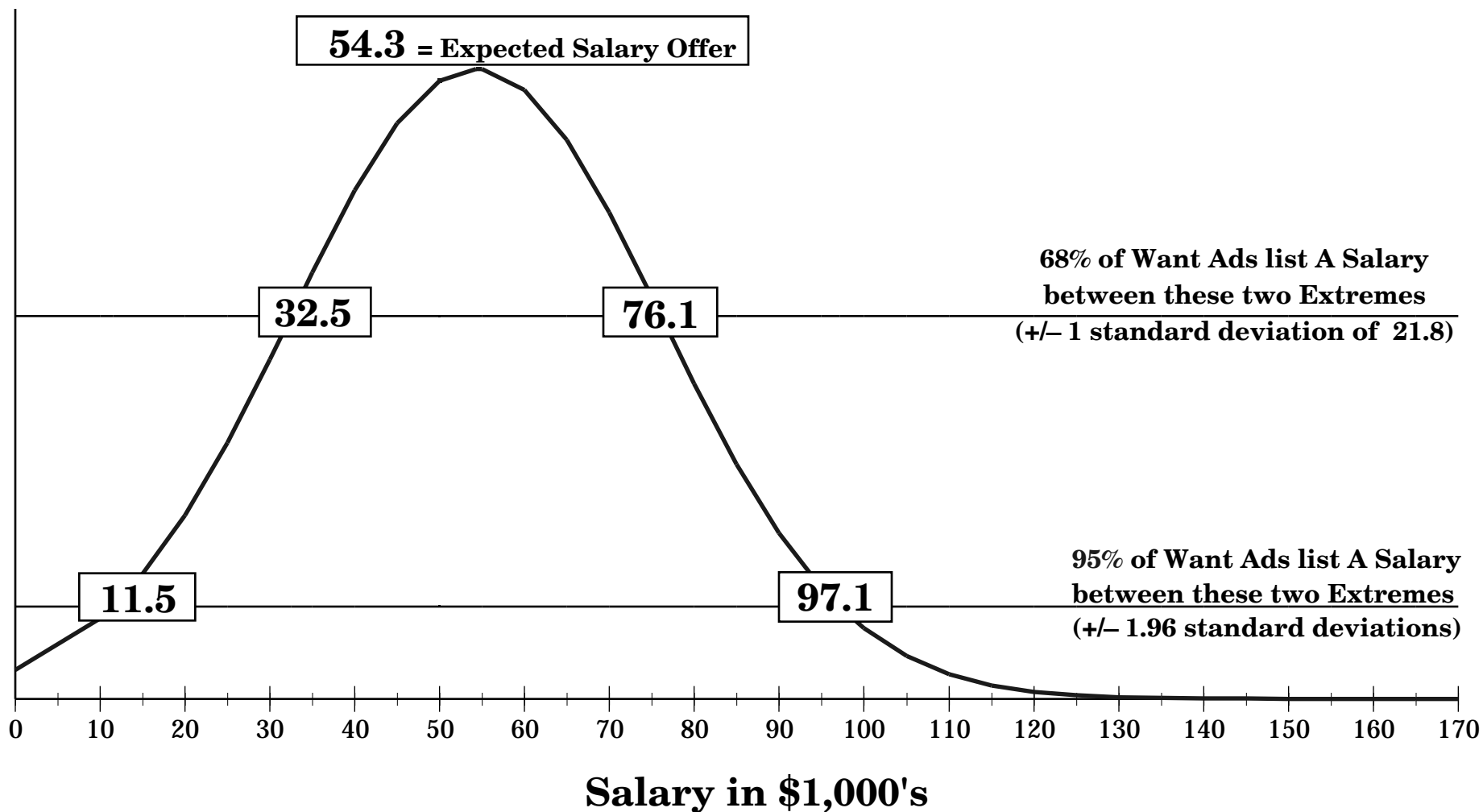
Extreme Salary Offers: 1 Year of Required Experience



**Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997**

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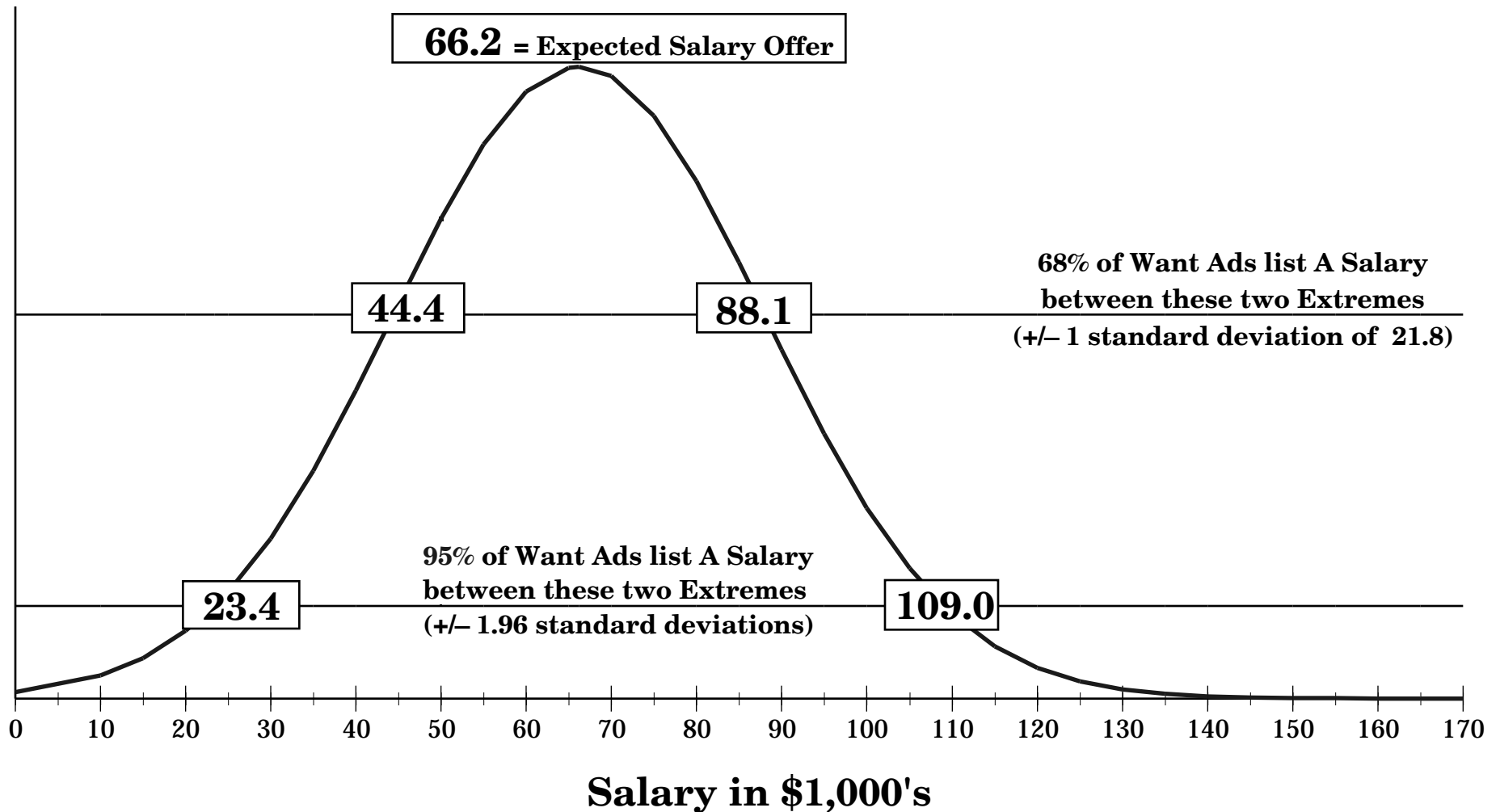
Extreme Salary Offers: 2 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997

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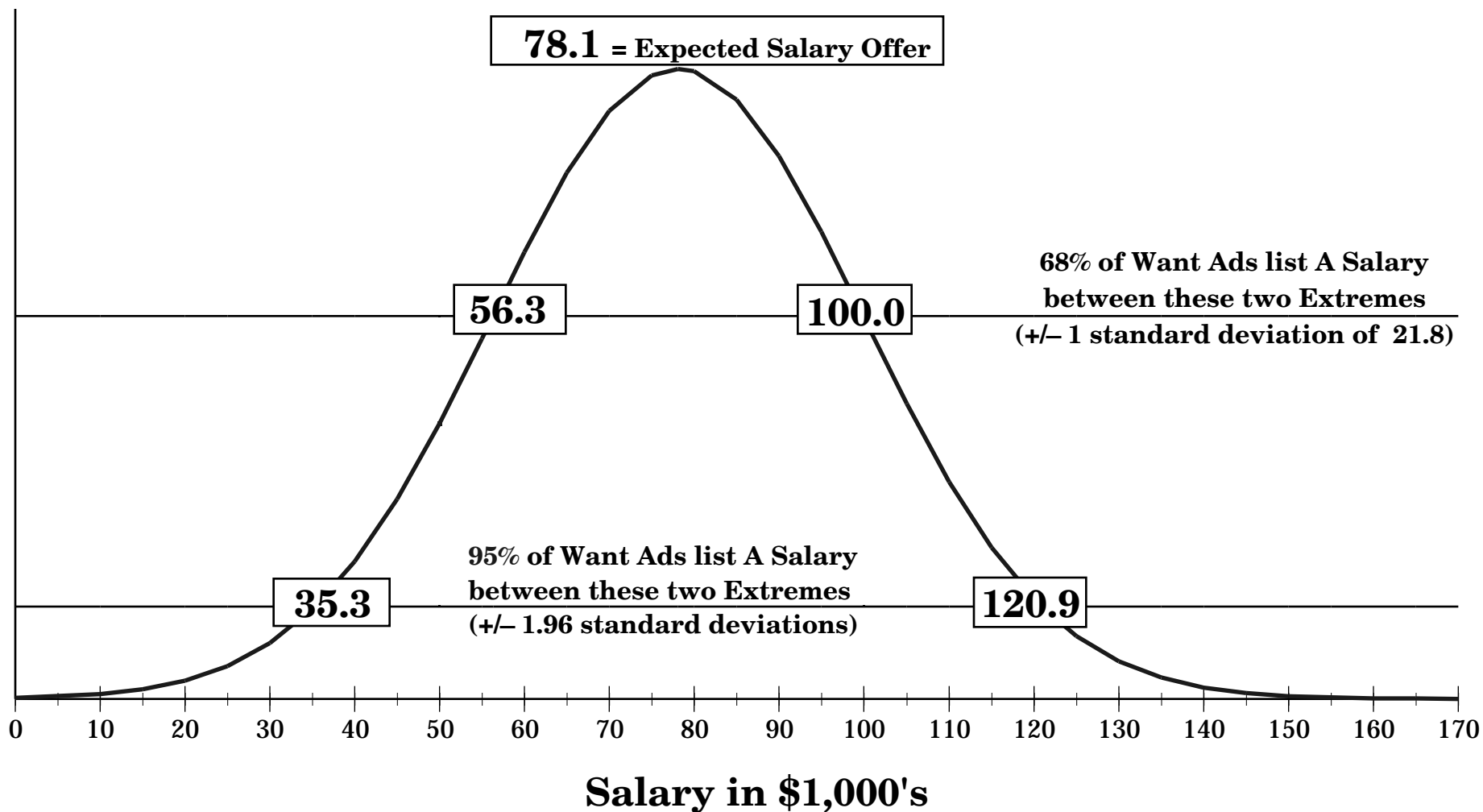
Extreme Salary Offers: 3 Years of Required Experience



**Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997**

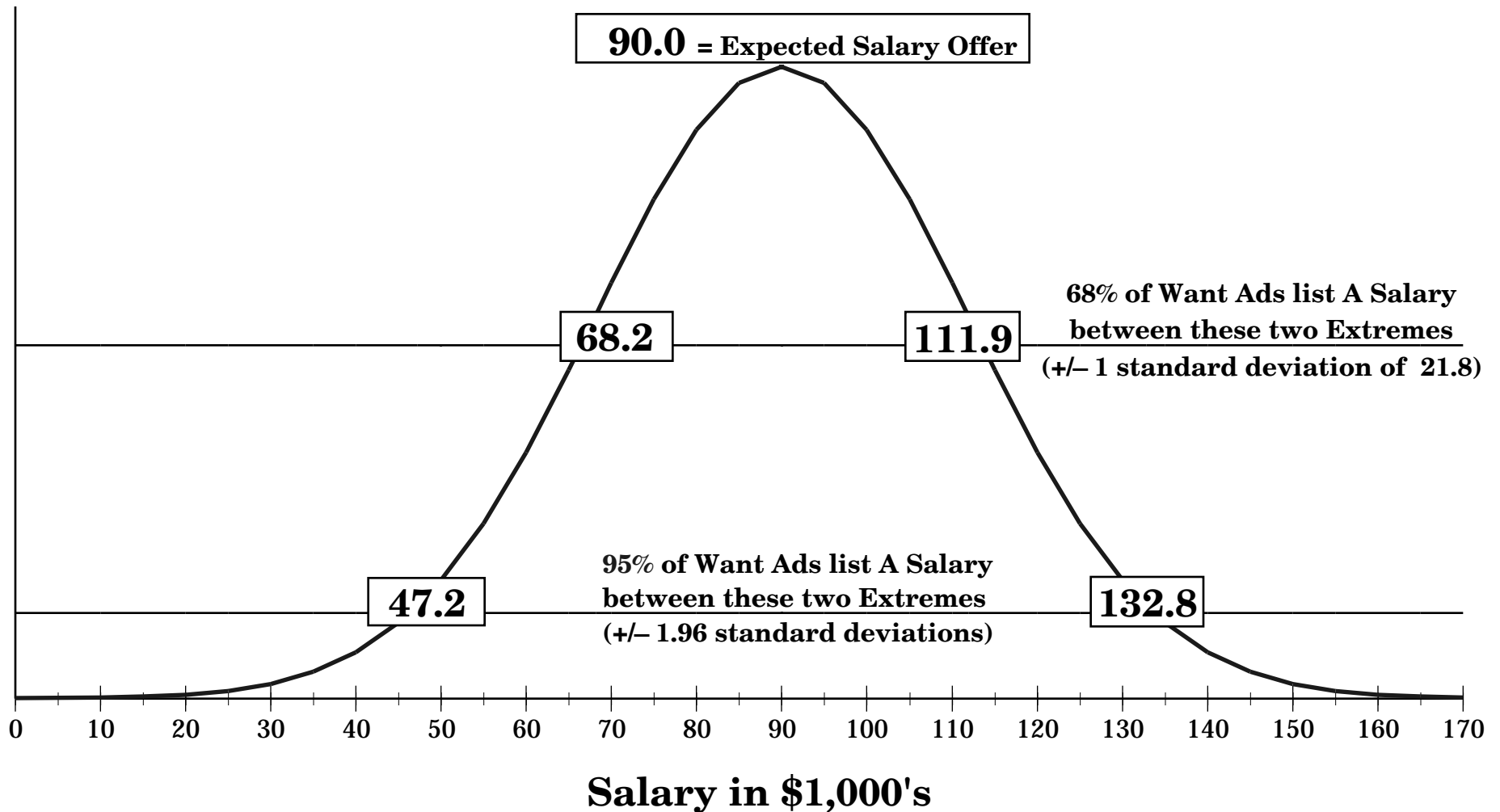
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Extreme Salary Offers: 4 Years of Required Experience



Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997

C/C++ & Visual Basic Programmer Extreme Salary Offers: 5 Years of Required Experience



**Sample Source: The New York Times
Sunday Employment section 52 Weeks from
January 5 through December 28, 1997**

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.

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Statistical Test Results

Regression Corrected for Heteroscedasticity

Regression Summary
Salary (H adj) vs. 3 Independents

Count	70
Num. Missing	0
R	.966
R Squared	.934
Adjusted R Squared	.931
RMS Residual	5.140

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 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 variability of salary offers around the Expected Salary Offer line is depicted in the 95% Probability Range of the expected salary offer and in the Extreme Salary Offer Graphs.

The R Squared statistic calculates the percentage of the variation in salary offers away from the mean salary offer, 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.

ANOVA Table
Salary (H adj) vs. 3 Independents

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	3	24961.764	8320.588	314.980	<.0001
Residual	67	1769.889	26.416		
Total	70	26731.653			

Regression Coefficients
Salary (H adj) vs. 3 Independents

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Entry Level (H adj)	30.503	3.440	.581	8.868	<.0001
Java (H adj)	11.933	5.854	.105	2.038	.0455
Years (H adj)	11.902	1.630	.394	7.301	<.0001

The statistical significance tests indicate a high level of quality for the expected salary offer numbers:

1. There is less than a .01% (one ten-thousandth) chance that there is no relationship between salary offers and experience requirements (P-Value in ANOVA Table).
2. There is less than a .01% (one ten-thousandth) chance that the entry level salary offer can't be defined (Entry Level P-Value in Regression Coefficients Table).
3. There is less than a .01% (one ten-thousandth) chance that the yearly increase in salary offer can't be defined (Years P-Value in Regression Coefficients Table).
4. There is a 4.55% chance that the Java effect can't be defined (Java P-Value in Regression Coefficients Table).

C/C++ & Visual Basic Programmer Heteroscedasticity Correction

Heteroscedasticity Regression Test

Dependent Variable = $\ln(\text{Resid}^2)$ Independent Variables: $X_1 = \text{C++}$, $X_2 = \ln(\text{Years})$

The variation in salary offers above and below the expected salary line increases at an increasing rate as the years of experience increase. In addition, the variation in salary offers above and below the expected salary line is larger when "C++" is asked for.

This additional information is factored into the analysis by dividing all columns by:
 $(e^{(0.236 + 3.232*\text{C++} + 1.793*\ln(\text{Years}))})^{.5}$

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

Test Results

R ² Statistic		F Statistic					
Count	70	DF	Sum of Squares	Mean Square	F-Value	P-Value	
Num. Missing	0	Regression	2	280.420	140.210	6.521	.0026
R	.404	Residual	67	1440.495	21.500		
R Squared	.163	Total	69	1720.915			
Adjusted R Squared	.138	t Statistics					
RMS Residual	4.637	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value	
		Intercept	.236	1.155	.236	.204	.8386
		C++	3.232	1.109	.326	2.914	.0048
		ln(Years)	1.793	.845	.237	2.121	.0376

Original Regression Test Results with Heteroscedasticity

R ² Statistic		F Statistic					
Count	70	DF	Sum of Squares	Mean Square	F-Value	P-Value	
Num. Missing	0	Regression	1	15155.364	15155.364	32.241	<.0001
R	.567	Residual	68	31964.314	470.063		
R Squared	.322	Total	69	47119.678			
Adjusted R Squared	.312	t Statistics					
RMS Residual	21.681	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value	

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	47.546	4.562	47.546	10.422	<.0001
Years	6.231	1.097	.567	5.678	<.0001

95% Confidence Intervals

	Coefficient	95% Lower	95% Upper
Intercept	47.546	38.442	56.650
Years	6.231	4.041	8.421