

C/C++ Programmer
Competitive Position™ Market Report

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Whole Root™ Economic Research, Inc
P.O. Box 603
South Glastonbury, CT 06073

<http://www.wholeroot.com/>

Toll Free: 1-888-413-1792
Fax: (860) 659-1792
E-mail: reports@wholeroot.com

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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,

Robert Gerald Vivona
Economic Statistician

Toll Free: 1-888-413-1792

Fax: (860) 659-1792

E-mail: bob@wholeroot.com

A Special Thanks to:

Nicholas Vivona
Computer Industry Consultant

C/C++ Programmer 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: 63

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			UNIX = 33
Language	C/C++ or C and C++		
Database			Oracle, Sybase, SQL Server or Informix = 13
Network			
MIS Software			
Industry		Banking, Investment Banking, Financial, Wall Street, Insurance or Accounting = 31	

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

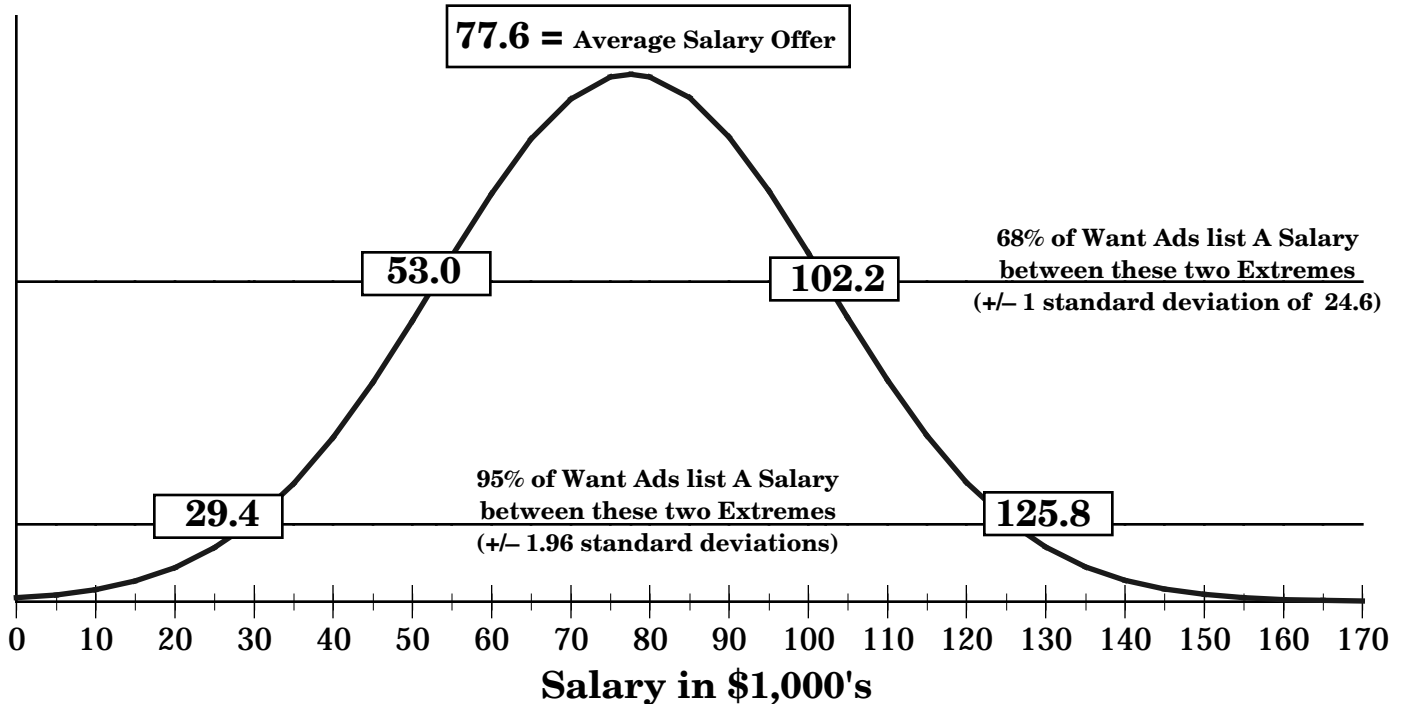
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Sample Averages and Distributions

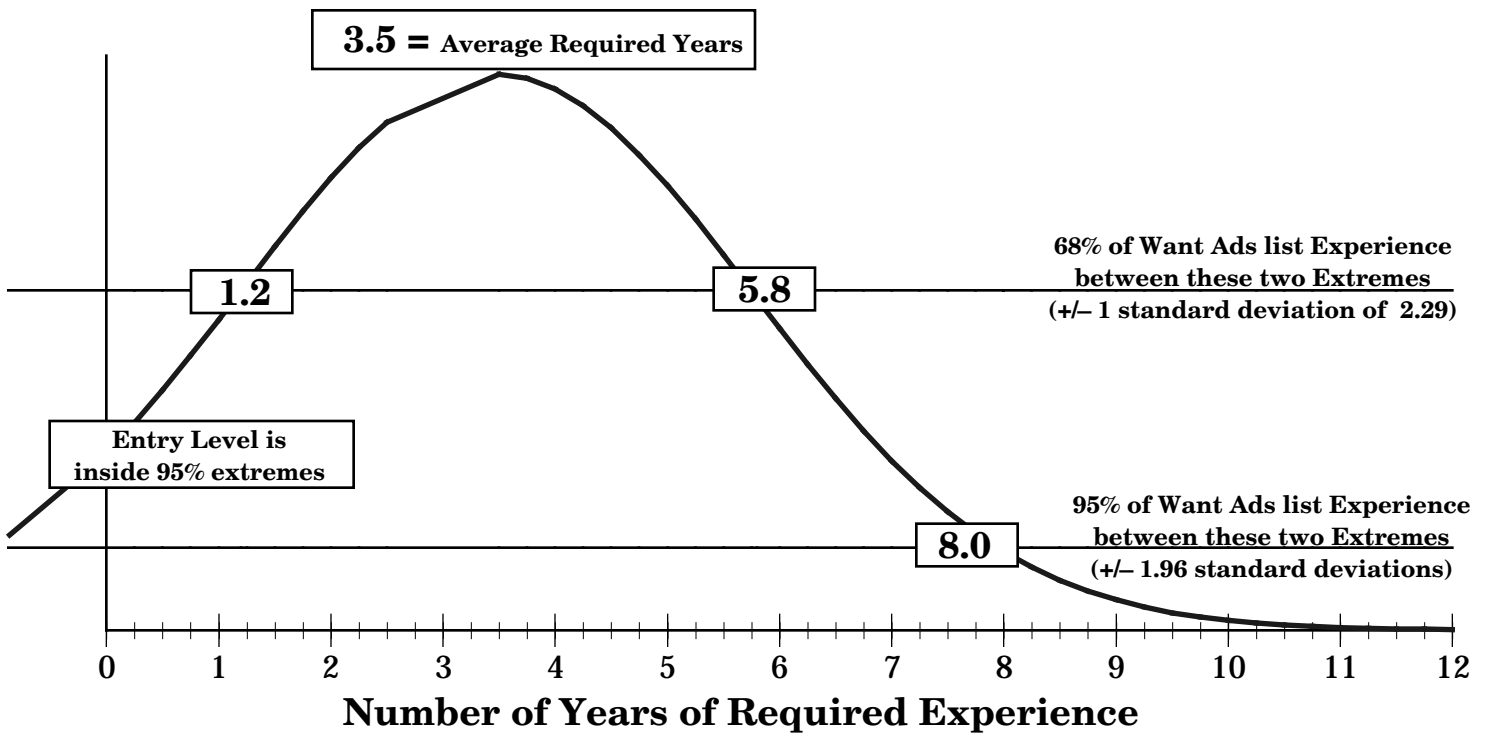
Sample Size: 63 Want Ads

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.

In 1997 wage inflation effected salary offers.

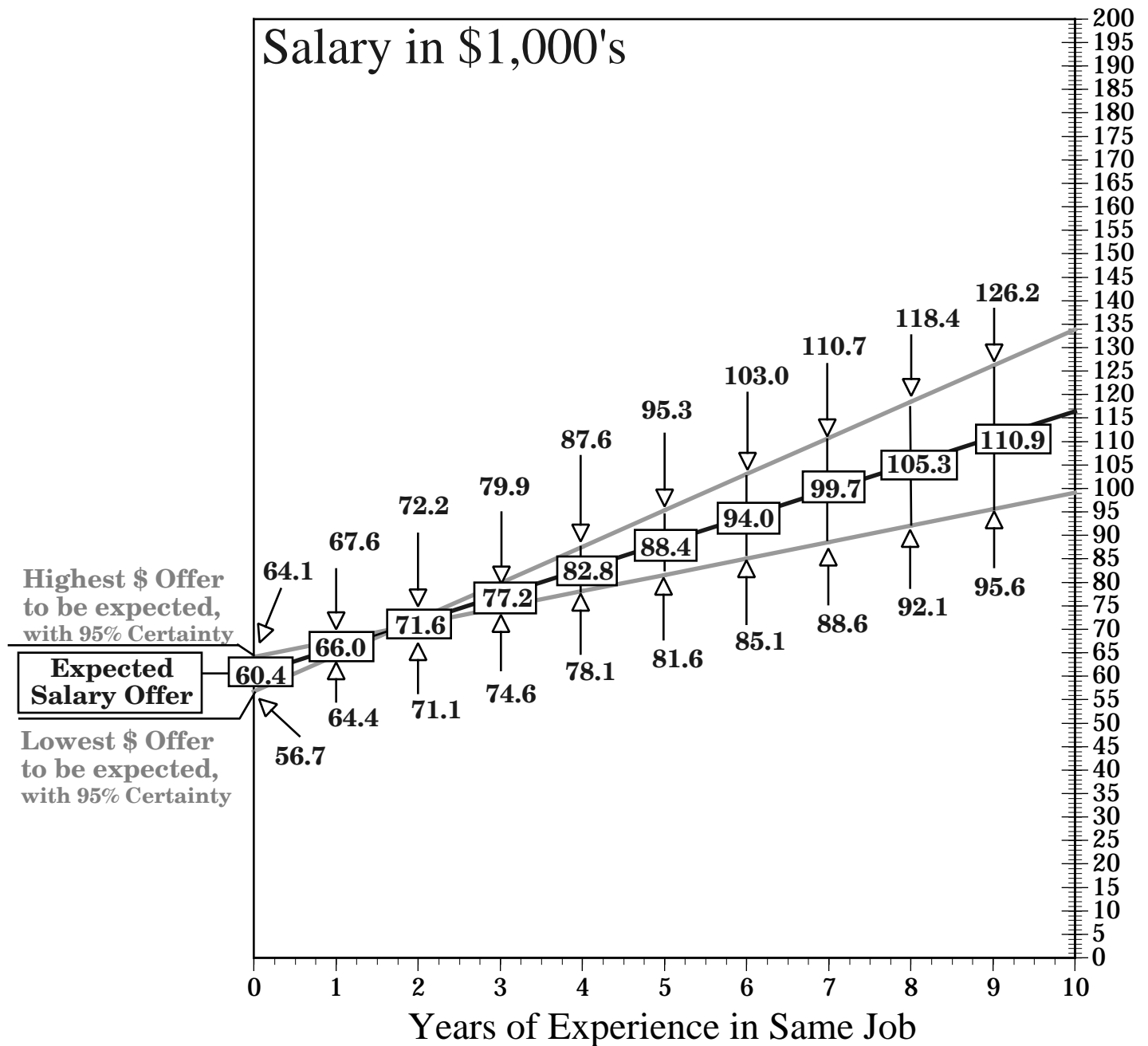
Salary offers were larger when Financial was listed in the want ad.

		Entry Level		Wage Inflation		Financial		Year of Experience
				Dollars of Inflation per Week Multiplied by Number of Weeks		Effect on Salary Offer only when listed in position description		Dollars per Year Multiplied by Number of Years
Expected Salary Offer	=	\$41.6	+	\$0.361 Weeks or 1997 = \$18.8	+	\$17.9 (if Financial) or 0	+	\$5.6 Years
First 95% Confidence Bound of Expected Salary Offer	=	\$56.7	+	\$0.001 Weeks or 1997 = \$0.1	+	\$27.2 (if Financial) or 0	+	\$3.5 Years
Second 95% Confidence Bound of Expected Salary Offer	=	\$26.6	+	\$XX.X Weeks or 1997 = \$37.5	+	\$8.6 (if Financial) or 0	+	\$7.7 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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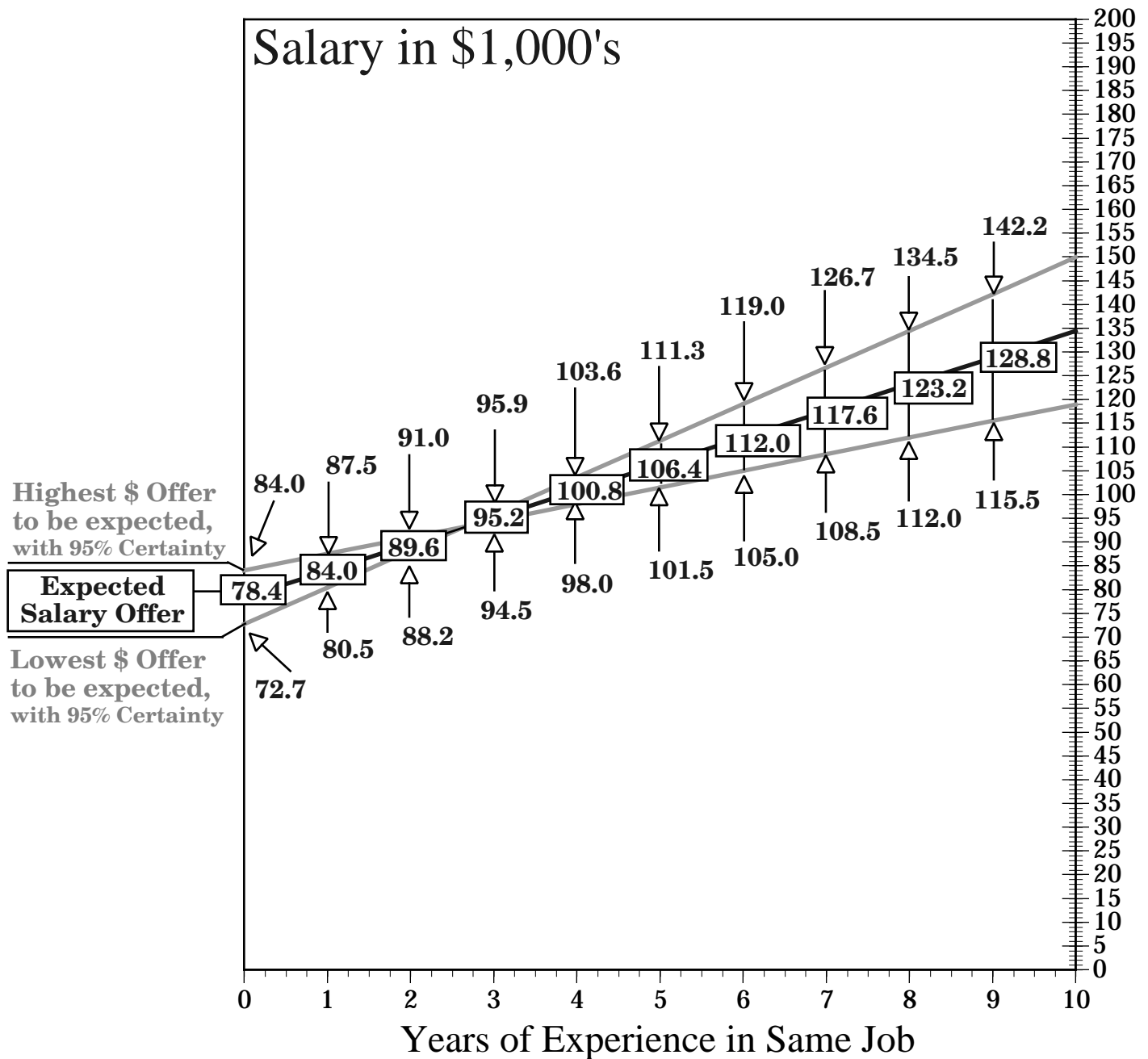
The Expected Salary Offer
& its 95% Probability Range
for Each Year of Required Experience



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

Financial C/C++ Programmer

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

C/C++ Programmer Wage Inflation

The statistical analysis indicates that Salary Offers are increasing by a fixed amount each week
Expected Wage Inflation = 0.361(Week) = \$18.8 per Year

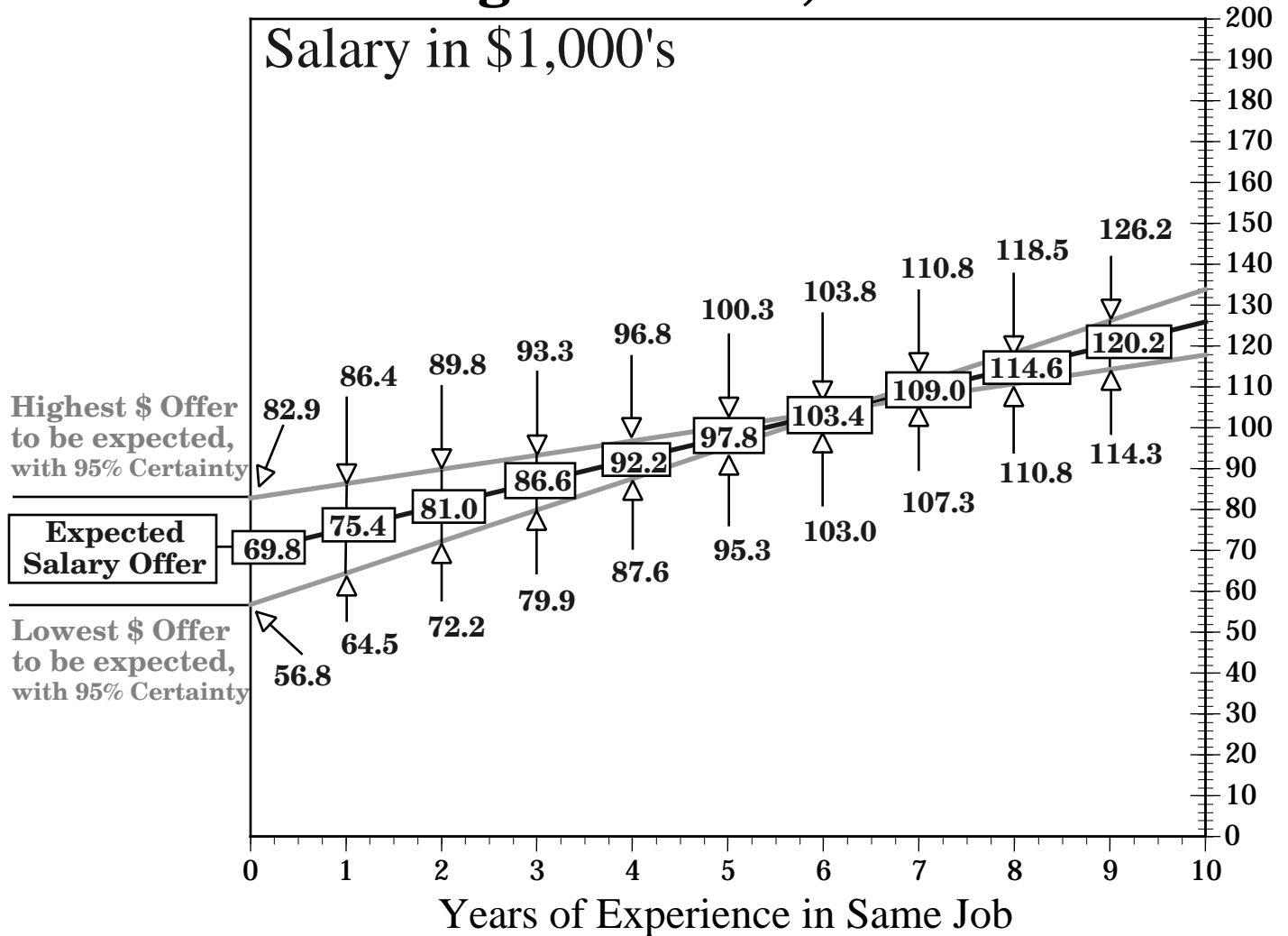
95% Confidence Interval

Highest Expected Wage Inflation = 0.721(Week) = \$37.5 per Year

Lowest Expected Wage Inflation = 0.001(Week) = \$0.1 per Year

Salaries in \$1,000 ; 52 Weeks per year

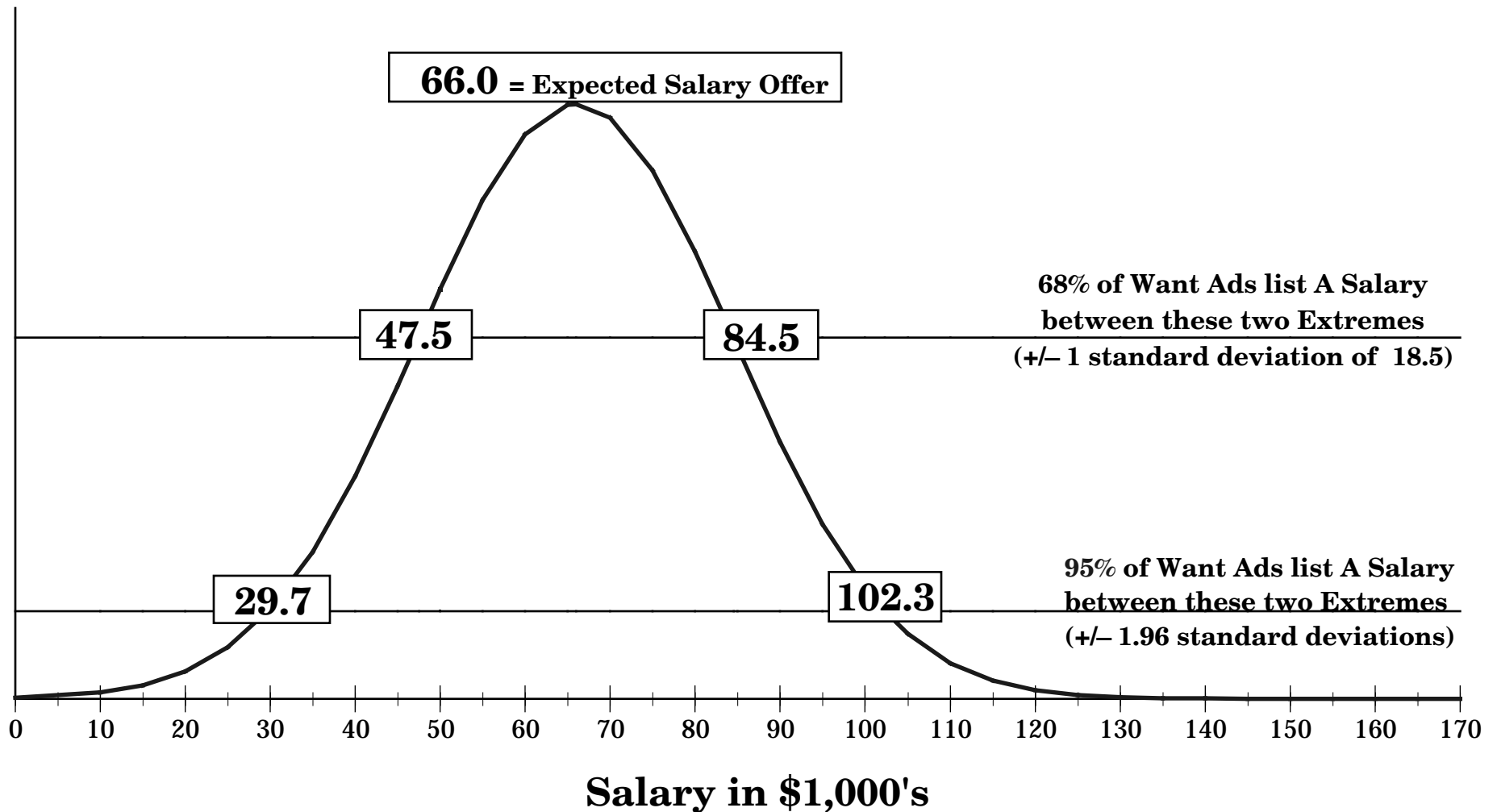
Predicted Salary Offers through June 28, 1998



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

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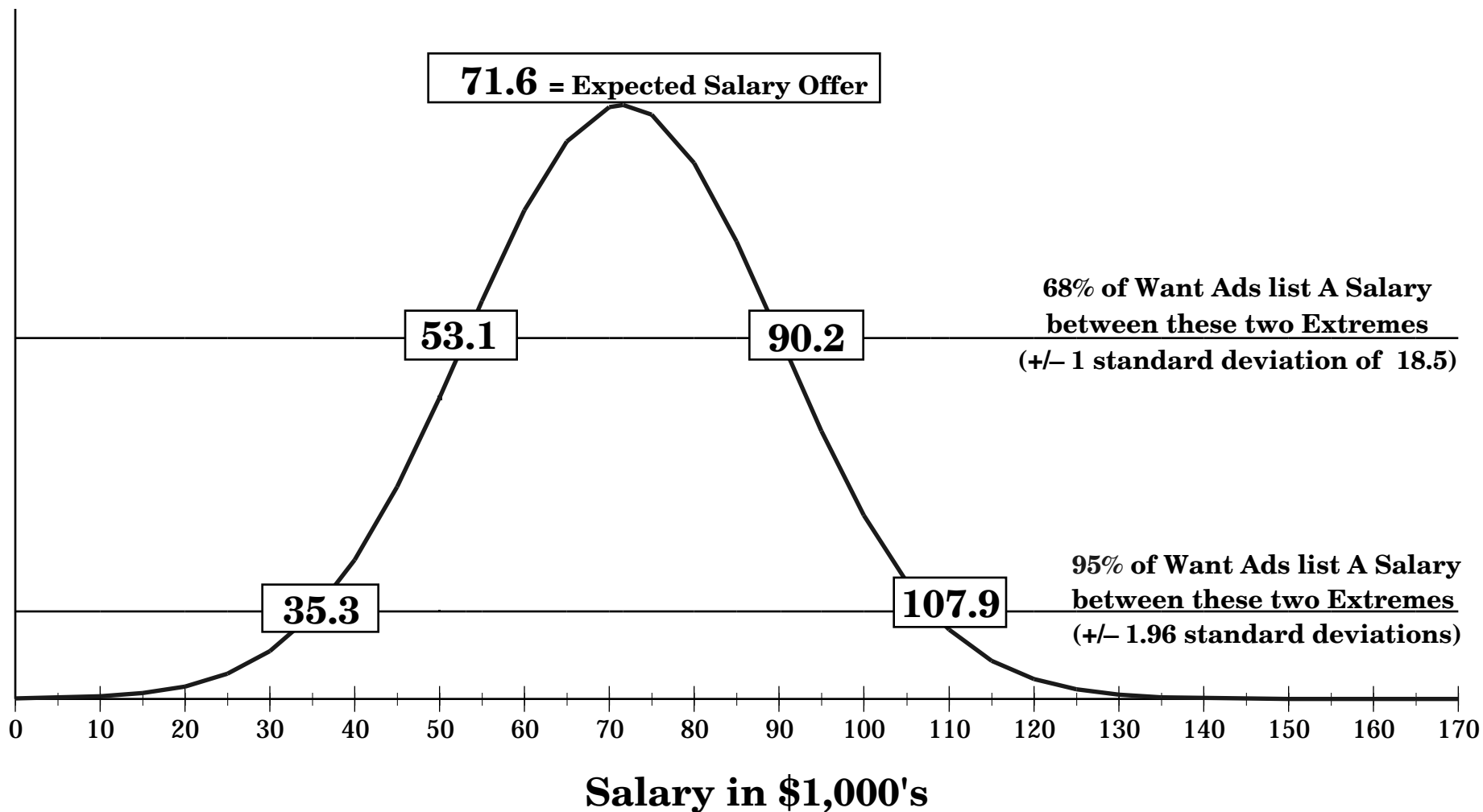
Extreme Salary Offers: 1 Year of Required Experience



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

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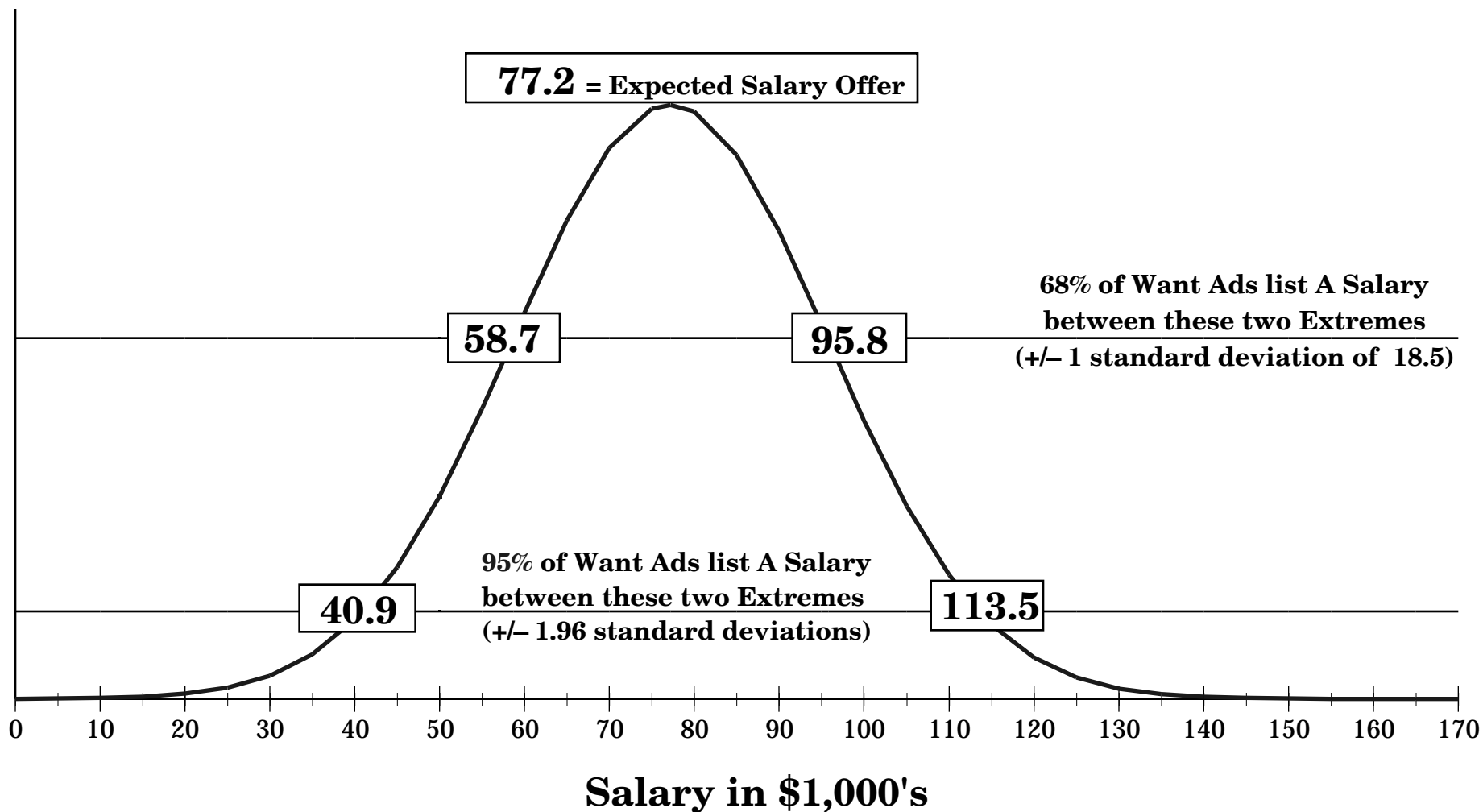
Extreme Salary Offers: 2 Years of Required Experience



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

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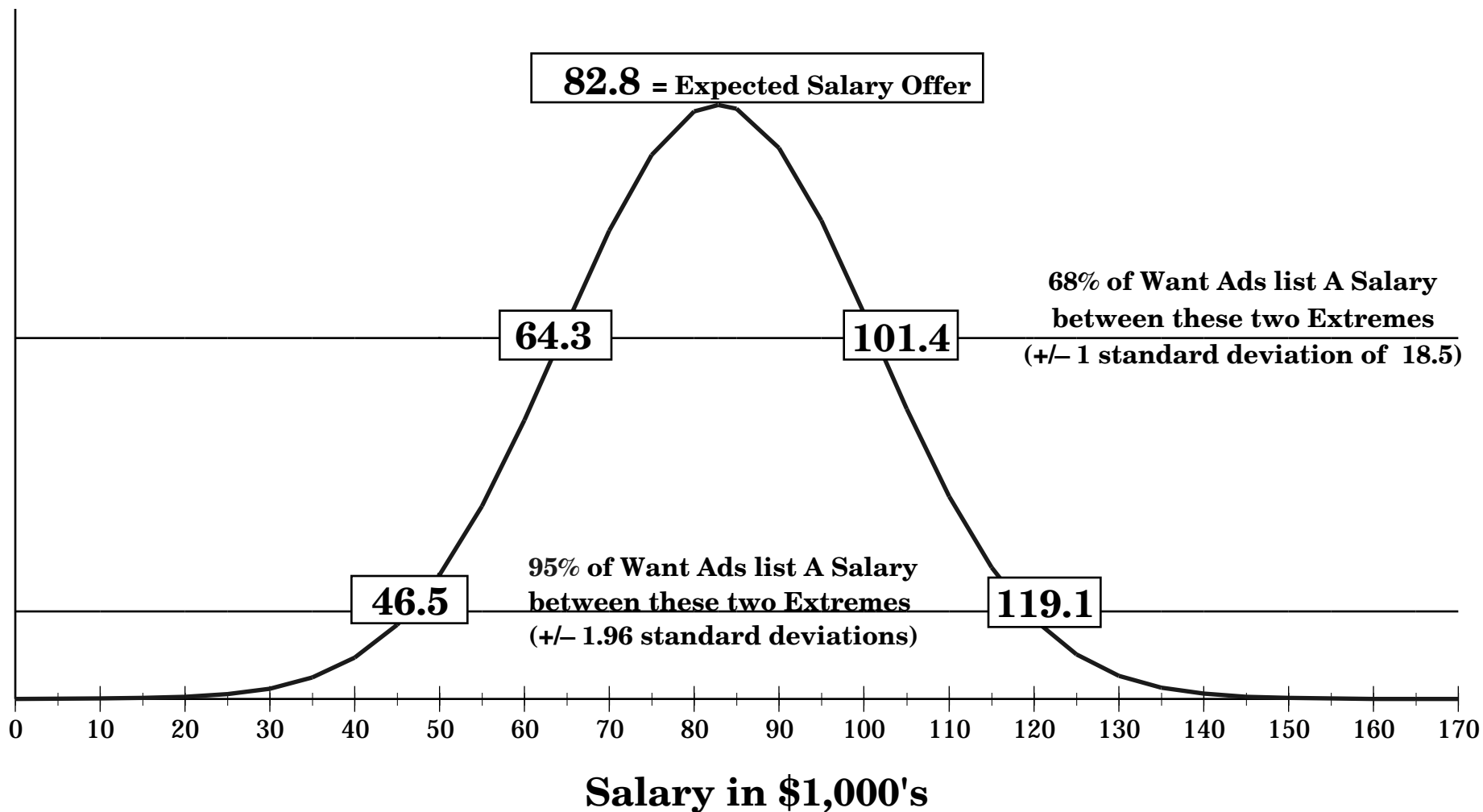
Extreme Salary Offers: 3 Years of Required Experience



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

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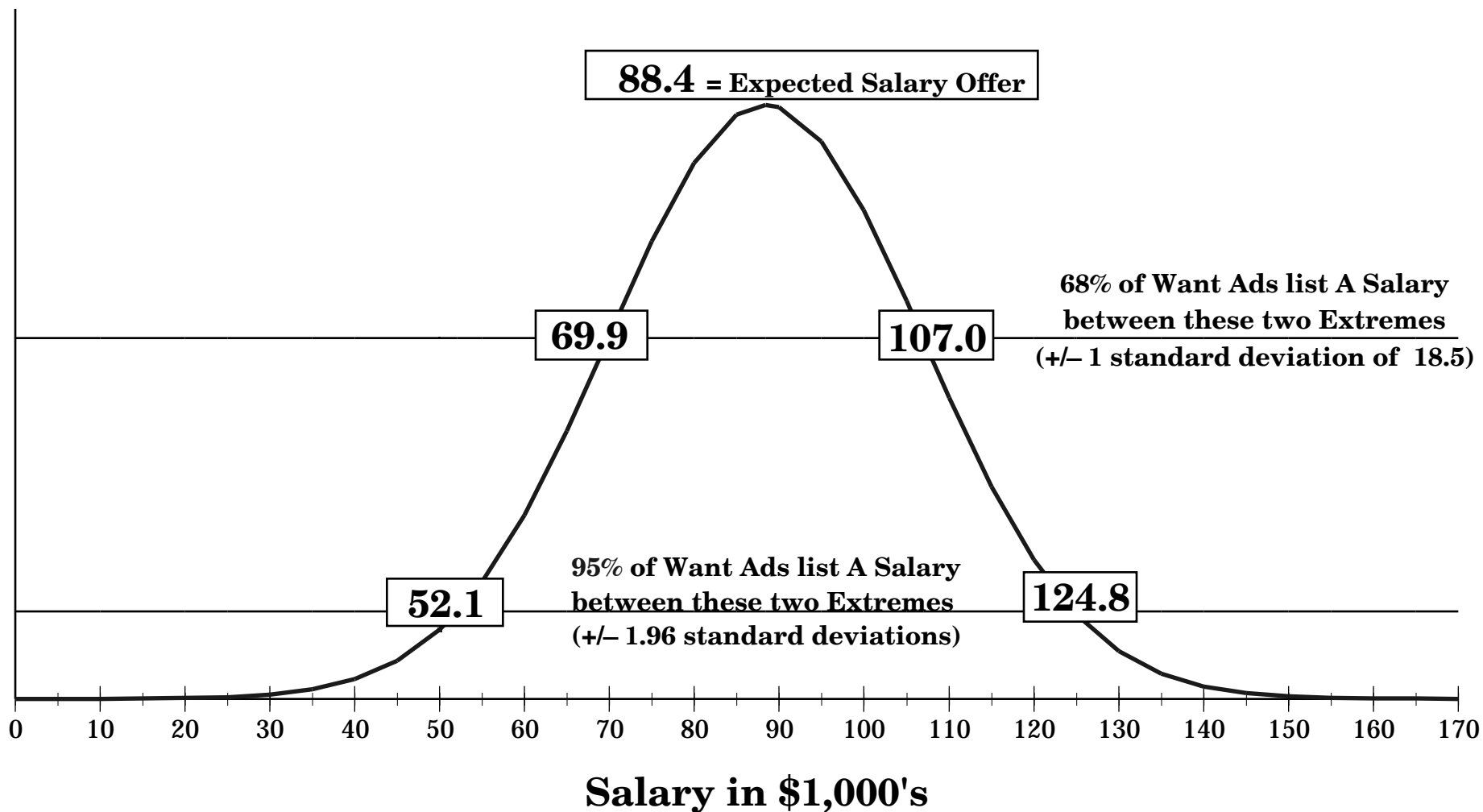
Extreme Salary Offers: 4 Years of Required Experience



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

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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 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. 4 Independents

Count	63
Num. Missing	0
R	.978
R Squared	.957
Adjusted R Squared	.954
RMS Residual	1.829

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. 4 Independents

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	4	4369.546	1092.386	326.566	<.0001
Residual	59	197.359	3.345		
Total	63	4566.905			

Regression Coefficients
Salary (H adj) vs. 4 Independents

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Entry Level (H adj)	41.645	7.511	.284	5.545	<.0001
Fin (H adj)	17.947	4.656	.279	3.854	.0003
Week (H adj)	.361	.180	.199	2.005	.0496
Years (H adj)	5.605	1.054	.375	5.317	<.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 4.96% chance that the Weekly wage inflation effect can't be defined (Week P-Value in Regression Coefficients Table).
5. There is a .03% (three ten-thousandths) chance that the Financial effect can't be defined (Financial P-Value in Regression Coefficients Table).

C/C++ Programmer Heteroscedasticity Correction

Heteroscedasticity Regression Test

Dependent Variable = $\ln(\text{Resid}^2)$ Independent Variable = $\ln(\text{Years})$

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

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

$$(e^{(6.566 - 0.638 \cdot \ln(\text{Years}))})^{.5}$$

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	63						
Num. Missing	0	Regression	DF	Sum of Squares	Mean Square	F-Value	P-Value
R	.277	Residual	61	228.745	3.750		
R Squared	.077	Total	62	247.817			
Adjusted R Squared	.062						
RMS Residual	1.936						
			t Statistics				
			Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
		Intercept	6.566	.851	6.566	7.720	<.0001
		ln(Week)	-.638	.283	-.277	-2.255	.0277

Original Regression Test Results with Heteroscedasticity

R ² Statistic		F Statistic					
Count	63						
Num. Missing	0						
R	.664						
R Squared	.441	Regression	DF	Sum of Squares	Mean Square	F-Value	P-Value
Adjusted R Squared	.413	Residual	59	20938.960	354.898		
RMS Residual	18.839	Total	62	37488.710			
			t Statistics				
			Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
		Intercept	22.951	8.504	22.951	2.699	.0091
		Fin	13.134	4.850	.269	2.708	.0088
		Week	.548	.172	.316	3.185	.0023
		ln(Years+1)	25.270	4.923	.500	5.133	<.0001

95% Confidence Intervals

	Coefficient	95% Lower	95% Upper
Intercept	22.951	5.934	39.968
Fin	13.134	3.429	22.838
Week	.548	.204	.893
ln(Years+1)	25.270	15.418	35.121