Spring 1999

Minimizing Shirking Through Labor Policies

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Date May 26, 1999

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* I would like to thank Dr. David Nelson for giving me access to the data set used in this paper. I would especially like to thank Dr. Paul Storer for acting as my advisor on this project. In addition to formulating the theoretical model used, he aided with estimation techniques, provided suggestions and feedback, and answered innumerable questions. This project could not have been completed with out his help.

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I. INTRODUCTION

The cost of employee shirking is an expense most retail sales companies face. As defined by Alan B. Krueger, shirking is "any employee action that reduces output."[1] Krueger cites common examples of shirking including theft, poor service, absenteeism, and high turnover. This study looks for statistical relationships between labor policies and the cost of shirking. We will also look at the cost effectiveness of using specific policies to decrease employee shirking.

In the field of economics, it has long been theorized that a direct, casual relationship exists between the level of wages paid and the effort expended on the job. However, many problems exist with proving this relationship with empirical data. Most of the models we researched had to assume a homogeneous labor force. This assumption does not allow the models to separate the variations in effort that stem from individual abilities from those that are related to the wage paid. Since all the workers are assumed to be of identical ability, then all differences in productivity must be due to wage policies. Our model is also unable to relax the assumption of a homogeneous labor force because our data does not provide an indication of worker heterogeneity.

Many of the empirical studies that do exist focus on the relationship between wages and effort in manufacturing. One of the most famous

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[1] Krueger (1991), pg. 84.

studies is that of Henry Ford's $5 workday. In 1914, Henry Ford almost doubled the wages of the workers in his auto factories to $5 per day. The increase in productivity combined with the fall in absenteeism and turnover more than compensated for the increase in labor costs.[2]

Such wage policy suggestions are harder to make for the service sector because effort in the service sector is more difficult to measure. To overcome the difficulty in measuring effort as a whole, this study uses the amount short from cash registers as an indication of low effort. By capturing effects of both theft and negligence, cash short can give us a good indication of the effort expended on the job. We also wanted to measure turnover and absenteeism as indications of low effort, but our data was unable to provide a reliable measure of these variables.

A further complication is that effort expended is also a function of how strictly employees are supervised. Though some have suggested that the relationship between supervision and the wage paid is direct, in our model, since an increase in effort can be had by either an increase in wages or an increase in the level of supervision, higher supervision and high wages are substitutes. A study by Alan B. Krueger finds empirical evidence of the inverse relationship between higher wages and higher levels of supervision. He studied the wage differentials between fast food restaurants that were company owned and those that were franchised. He found that the less supervised company owned stores paid low-level managers about 9% more that did the more highly supervised franchised stores. Also, crew workers of the company run stores earned 1%-2% more than crew workers at the franchised restaurants.[3] While our theoretical model does make effort a

[2] Raff (1987).

[3] Krueger (1991).

function of supervision, we do not have the data on supervision to try to estimate the empirical relationship.

In this study, definite relationships were established between the amount of cash short from a register and labor policies. The larger the spread between a firm's starting wage and the highest cashiers wage, the lower the cash short. An inverse relationship between the payment of incentive pay to cashiers and cash short was also found. An increase in the number of W-2s issued for managers and cashiers was associated with an increase in the amount of cash short. The difference between the firm's highest cashier's wage and the state's average wage was unexpectedly found to be positively related to cash short.

The remainder of the paper consists of a description of the model, including the null hypotheses. I will then discuss the data and the significant variables. After performing statistical tests of model specification, I will detail the regression results. Next, I will calculate the cost effectiveness of suggested policies. In conclusion, I will summarize the practical applications suggested by this study.

II. THE MODEL[4]

In our model, an employee's utility is a function of the wage they receive and a negative function of the effort they expend on the job. To illustrate the theoretical model, we will reduce the wage and utility variables to binary terms; a higher-than-average wage,(W); a low wage,(w); high effort,(1); and low effort or shirking,(0). In an employment situation where a high wage is offered, an employee may chose to give high or low effort. Using the theory of expected utility, we can examine what makes an

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[4] Theoretical model formed and suggested by Dr. Paul Storer.

employee choose to give high effort.

We can calculate the expected value of utility using a von Neumann-Morgenstern utility function. A von Neumann-Morgenstern utility function calculates the expected utility by summing possible utilities multiplied by the probabilities of the possible utilities.

If a worker is in a high paying job, he may choose to give little effort. While this maximizes his utility if he is not caught, if he is caught shirking, he will face losing his high paying job and having to accept an average paying position. The probability of being caught shirking is denoted as rho. Thus, when a high wage worker chooses to shirk, his expected utility equals:

$$E(U)_{W,0} = \left[(1-\rho)\times u(W,0)\right] + \left[\rho \times u(w,0)\right]$$

A high paid worker who does gives high effort faces lower utility than a shirking worker who is not caught, but may face a higher expected utility because there is no risk of being fired. Therefore, a worker will choose to give low effort only if the expected utility while shirking exceeds the expected utility while giving high effort. The cost of shirking increases as the spread between the high and low wage increases and as the probability of being caught increases.

The empirical model used in this study is an Ordinary Least Squares regression using a semi-log function.

$$\begin{aligned}
\ln(cash_short)_i &= \beta_1 + \beta_2(Big_8_Sales)_i + \beta_3(Big_8_Sales)^2{}_i \\
&+ \beta_4(Cashier_W2s)_i + \beta_5(Manager_W2s)_i + \beta_6(Cashier_Incentive_Pay)_i \\
&+ \beta_7(Managers_Bonus)_i + \beta_8(Optimum_Cashiers)_i + \beta_9(Urban)_i \\
&+ \beta_{10}(Interstate)_i + \beta_{11}(NewHire_Training_Hours)_i + \beta_{12}(CreditCard_Cost)_i \\
&+ \beta_{13}(Average_Gap)_i + \beta_{14}(Firm's_Wage_Gap)_i + \varepsilon_i
\end{aligned}$$

A semi-log function is used when the effects of the independent variables on the dependent variable gets larger as the dependent variable gets larger. This occurs because the coefficients of the independent variables are the percent changes that a one unit change in the independent variable causes in the dependent variable. To calculate the absolute change caused by a one unit change in the independent variable, we simply have to multiply the coefficient (percentage change) by the original amount of the dependent variable. We can see that the absolute change in the dependent variable will be larger when the original amount is large.

The null hypotheses tested by this model are: 1) that a store that gives employees more opportunities for future hourly wage increases will have less cash short. 2) that a firm that is relatively more generous than other firms in the same state will have less cash short. 3) the payment of incentive pay to cashiers decreases the amount of cash short. 4) that a larger number of employees that worked for the firm within the year, as measured by the number of W-2s, will have a direct relationship with cash short.

The use of the semi-log function is particularly beneficial in our cost/benefit analysis. Since the dependent variable is the log of cash short, the results of the regression are interpreted such that a one unit change in the independent variable causes a percentage change in cash short equal to the coefficient of the independent variable. Using this property, we can calculate the dollar effect on cash short of a change in labor policies by multiplying the coefficient of the changing independent variable by the original amount of cash short. Since the coefficient is a percentage change of the original cash short, stores with larger cash short problems will have greater benefits from the policy change. By subtracting the cost of the policy change from the benefit, we can see if a net cost or net benefit will result.

III. THE DATA

The data used in this model is 1997 data contributed by 343 convenience stores located throughout the United States. Each firm completed a form on a disk and submitted the disk. The entire data set was compiled directly from the disks. The data was collected by Francis Bologna at Wegmann-Dazet & Co. and was provided to me by Dr. David Nelson and Dr. Paul Storer. Thirty-six observations were eliminated because cash short was either or equal to zero and so the log of those variables could not be found. The negative cash short could be either an entry error or mean that the registers actually had more too much cash. I used the remaining 307 observations to estimate the regression.

In familiarizing myself with the data, I discovered that some convenience stores reported extremely large cash short amounts. I decided not to eliminate the outliers because I could not be sure they were data entry errors. Summary statistics of the variables are included in Appendix 1.

Cash short refers to the dollar amount that each convenience store reported was short from the cash registers in 1997. Though employee effort can not reliably be measured, evidence of low effort can be. Cash short serves as a proxy for shirking, capturing costs due to theft of cash and negligence at the register. Summary statistics and a histogram of cash short appear in Appendix 2.

Big 8 sales is the 1997 dollar amount of tobacco, alcohol, beverage, snack foods, packaged and frozen foods, grocery items, and general merchandise sales. This means that gasoline sales and other sales such as deli, car wash, lottery, etc., are not included This variable is included because the size of a store very likely affects the amount of cash short because the increased number of transactions allow for more opportunities for theft and mistakes. Summary statistics and a histogram of Big 8 sales can be viewed in Appendix 3. The square of Big 8 sales was also included because the evidence suggested that the relationship between sales and cash short was not linear.

The manager and cashier W-2 variables measure the number of W-2 forms issued for each type of employee in 1997. Since the number of cashiers and managers employed at each firm at the year's end is not known, the number of W-2s can not be used to measure turnover. Instead, a large number of W-2s could indicate many employees, a high turnover, or some of both. By including the number of W-2s issued as an explanatory variable, we can see if the number of employees with access to the registers affects cash short.

Cashier incentive pay is a binary variable. A 1 indicates that some sort of incentive pay is offered to cashiers. This explanatory variable may be significant if the employees view the incentive pay as effectively increasing their wage. This higher wage would increase the cost of shirking. However, incentive pay was not defined in the instructions to the firms and so a wide range of incentives and dollar amounts may be included. This restricts the depth of the conclusions that can be drawn from the results relative to this variable.

The optimum number of cashiers was also not defined for the firms. The most likely interpretation is how many cashiers the firm usually aims to employ at one time and probably was included as a question in order to be used to help calculate turnover. However, because of the lack of instructions, firms could have reported an optimal number that differs significantly from the number they usually have employed. As an example, if a firm thinks that an optimal number would consist of enough full-time employees to cover all shifts, but the usual state of the firm is twice as many part-time employees, a turnover calculated based on the reported optimal number of cashiers would be greatly overstated.

The urban and interstate variables are also binary variables where a 1 signifies that the convenience store is located in the designated area. When both the urban and interstate conditions are negative then the convenience store is located in a rural area.

New hire training hours refers to the number of paid hours that each employee is trained upon being hired.

Credit card cost is actually the dollar amount of sales that are paid for by credit cards. I included this variable as an explanatory variable because credit card transactions allow fewer opportunities for theft or mistakes than do cash transactions.

The average gap is defined as the firm's top wage minus the average wage of all the stores in the same state. This variable is used as a measure of how generous a store may appear to employees compared to other stores in the state. Summary statistics and a histogram of the average gap are found in Appendix 4.

The firm's wage gap measures the spread between the top wage a firm pays employees and the starting, base wage paid. This variable measures the possibility by advancement for remaining with the company. If, by remaining with a company, an employee can expect to significantly increase their future earnings, being fired will entail a higher cost than if there is no possibility of increased earnings. Summary statistics and a histogram of the firm's wage gap appear in Appendix 5.

IV. THE RESULTS

The regression results can be viewed in Appendix 6. Before we begin to draw conclusions from these results, we must test for violations of the Classical Linear Assumptions. Important problems to identify and, if necessary, eliminate are multicollinearity, autocorrelation, and heteroscedasticity.

Multicollinearity means that two or more of the explanatory variables are highly correlated with one another. When multicollinearity exists in a model, the coefficient estimates will be imprecise because the effects of the correlated variables can not be separated. While no standard test has been established to identify multicollinearity, it is indicated by a high R^2 but low t-statistics, non-robust regression results, and a high correlation between variables. As we can see by the Correlation Matrix in Appendix 7, there is a high correlation between the average gap and the firm's wage gap. While there is no ready solution to fix this problem, I used differences in the wages to minimize the effects.

Autocorrelation is a violation of the Classic Linear Regression assumption that the residuals of a regression are independent. If autocorrelation does exist, estimation by the Ordinary Least Squares method will calculate coefficient estimates that are unbiased but inefficient. This means that, due to the unnecessarily high variance, it is more likely that any given sample of the population will estimate coefficients that are far off the true values. Another problem that occurs when autocorrelation exists is that the estimates' estimated variances are biased, usually downward, which leads to t-statistics biased away from zero so that null hypotheses may be incorrectly rejected. Due to these problems, if autocorrelation does exist, it is important to detect and correct for it before drawing conclusions from the model.

Since autocorrelation is a correlation between the residuals, the problem often becomes apparent by looking at a plot of the residuals. We calculate the residuals using the OLS method. As we can see in the plot of the residuals in Appendix 8, there does not appear to be a pattern.

For a definitive answer, we compute the DW test. E-View calculates the DW statistic for our model and we need to compare this to the critical statistic. Using N=200 observations[5] and k-1=13 independent variables, excluding the intercept, we find that the 1% critical d_u DW statistic is 1.813.[6] Comparing this to our calculated DW of 1.829945 (seen in the regression results) we can be more than 99% sure that first-order autocorrelation does not exist in our model. This coincides with the randomness seen in the plot of the residuals.

Heteroscedasticity is the violation of the assumption that the error terms have a constant variance. This problem causes the estimated coefficients to be inefficient so that any given estimate may be far off its true value. The estimated variance, however, will be underestimated causing the additional problem of inflated t-statistics. Heteroscedasticity is associated with cross sectional data and, therefore, is more likely to be a problem in this model than is autocorrelation. From amoung the standard tests for heteroscedasticity we chose the White Heteroscedasticity test which is easily calculable in E-Views. We can see the results in Appendix 9. With

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5 Our actual N=307, but I was unable to find a more suitable DW table. Since an increasing number of observations reduces the critical d_u statistic, our calculated DW would still be above the d_u statistic using N=307.

6 Critical DW statistic taken from Basic Econometrics, Gujarati, Damodar N. McGraw-Hill, Inc. New York. 1995. p. 821. They had taken it from Savin and White, op. cit., by permission of the Econometrics Society.

almost 92% probability, we can reject the null hypothesis that heteroscedasticity exists in this model.

To measure how well the explanatory variables actually do explain deviations in the dependent variable, we look at the adjusted R^2. Many times R^2 is mistakenly used to measure the fit of a model. However, R^2 increases whenever any explanatory variable is added to the regression so a large R^2 can be had by simply adding infinitely many explanatory variables. Adjusted R^2 eliminates this problem by weighing the benefit of each additional explanatory variable against the cost of degrees of freedom. Unless the additional variable contributes significantly to the explanatory power of the model, adjusted R^2 will decrease. For this model, the adjusted R^2 is .248503. This is a reasonable adjusted R^2 for a set of cross-sectional data.

T-statistics measure the probability that the related variable does not significantly contribute to explaining the dependent variable. The optimum number of cashiers, the location variables, the payment of cashier incentive pay and managers bonuses, and credit card charges all can be rejected as significant at the 5% level. The remaining variables are well within the 95% probability of significance standard.

We are now ready to discuss the coefficients estimated in our regression. The location of stores may not be significant, however, the coefficients suggest that a location in an urban area or near an interstate increases cash short. While the optimal number of cashiers may also be insignificant, an inverse relationship is suggested. Additional training hours and credit card charges both may have positive effects on cash short.

The signs of the coefficients on the Big 8 sales variables provide valuable information. The coefficient on the Big 8 sales variable is positive, meaning that as the sales of a store increase, so does the cash short. However, the coefficient on the Big 8 sales squared variable is negative, suggesting that the effect of sales on cash short decreases as sales become larger. This makes sense because more sales allow more opportunities for theft and errors, but as a store's size increases, the opportunities for theft may also be mitigated by increased security measures. This is especially true when there are large up-front costs to install the security measures.

A small negative relationship was found between the payment of bonuses to managers and cash short. A store that does pay manager bonuses can expect to have a tiny percentage less cash short than a store that does not pay bonuses to managers.

Looking at the variables which deal with labor policies and for which null hypotheses were formed, the only surprise was the results related to the generosity of the firm relative to the state in which it is located. The null hypothesis relating to this variable was that an inverse relationship would be established. While the generosity of the firm compared to the state did prove to have a strong relationship with cash short, it proved to be a positive one. The coefficient of .534684 suggests that a one dollar increase in the spread between the top wage in a firm and the state average wage causes about a 53.5% increase in cash short. This unexpected result may be an effect of multicollinearity.

Both the number of cashier and manager W-2's issued annually do have a positive relationship with cash short. Each additional cashier W-2 issued results in a 2.4% increase in cash short while each additional managerial W-2 issued is related to a 11% increase in cash short, all else held constant. Two ways to decrease the number of employees are to reduce part-time employees in favor of full-time help and to reduce employee turnover.

We hypothesized that the payment of cashier incentive pay would have an inverse relationship with cash short. While an inverse relationship is suggested, the model also suggests that cashier incentive pay may not be significant in explaining the amount of cash short.

The null hypothesis related to the prospect for wage increases was that an inverse relationship would be found. This hypothesis can be accepted. A one dollar increase in the spread between a firm's top wage and their base wage will cause almost a 64.5% decrease in cash short.

V. COST BENEFIT ANALYSIS

The percentage changes that can be effected by a change in firm's wage gap may seem impressive, but we must remember that if a firm raises its top wage, its average gap is also affected. Since the firm's wage gap is usually fixed at the lower end by minimum wage laws, its only choice to expand the wage gap is to raise its top wage. Raising the top wage causes a 64.5% decrease in cash short, but also increases the average wage gap, causing a corresponding increase in cash short of 53.5%. The net effect on cash short will only be a decrease of about 11%:

Benefit = (.644868-534684)*(Cash Short) = (.110184)*(Cash Short)

From the benefits, we subtract the cost of the one dollar wage increase. I assumed that the new top wage would apply to one-fourth of the cashiers. Since I do not have any information on the percentage of employees currently earning the top wage, I can not be sure if the on quarter assumption is high or low. Due to variations in wage structures and the length of employee's employment, I imagine that, between stores, there is also significant variation in the percentage of employees that make the top wage. Since it is reasonable to assume that less than 50% and more than 0% of employees will make the top wage, I chose the midpoint of 25%.

Cost = $1.00*.25*(Annual Cashier Hours) + $1.50*.25*(Annual Cashier Overtime)

The net result for all but three of the convenience stores was that the cost of the higher wage would be greater than the benefits. The three stores for which it would be profitable to enact the greater wage started with large amounts of cash short. If the observations are true, then it makes sense that a store with an originally large cash short problem would benefit more than a store with a smaller cash short problem. However, we need to recognize that the observations may be data entry errors and we must be careful with our interpretations of the results.

The summary statistics and histograms of the benefits, costs, and results can be viewed in Appendices 10, 11, and 12.

VI. CONCLUSION

Though the calculations suggest that most stores will not benefit from altering their labor policies, we must remember that cash short is a proxy variable for low effort. If other forms of shirking such as poor service, theft of goods, absenteeism, and high turnover are similarly reduced by a higher wage, the benefits could be significantly higher.

While we can only perform a cost/benefit analysis on the labor policy of increasing top wages, the payment of incentive pay could be a cost effective way of reducing cash short. A store may be able to construct an incentive plan that will provide a net benefit.

Appendix 1

Summary Statistics

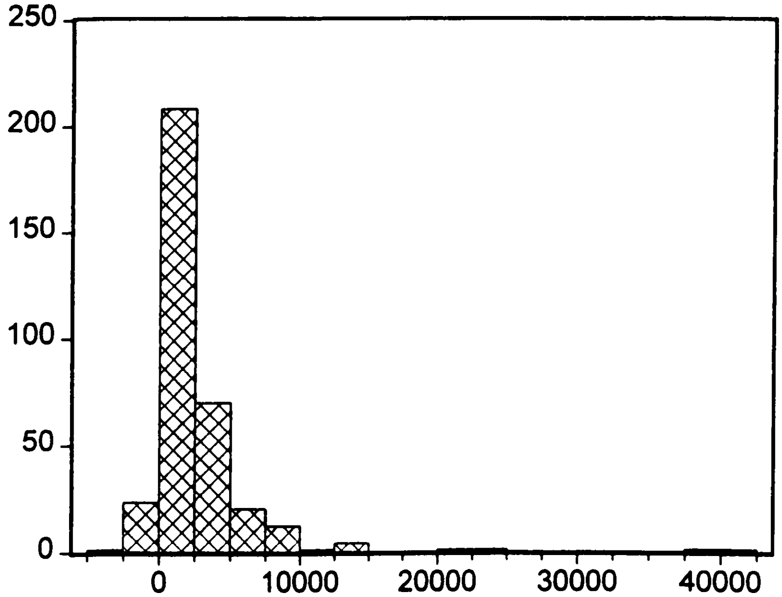
	Cash Short	Big 8 Sales	Cashier W2s	Manager W2s	Cashier Incentive Pay
Mean	$2,531.50	$512,251.90	18.2449	2.463557	0.379009
Median	$1,393.00	$453,964.00	15	2	0
Maximum	$41,379.00	$2,172,226.00	95	10	1
Minimum	-$2,667.00	$15,486.00	0	0	0
Std. Dev.	$4,145.93	$258,254.40	12.2586	1.431981	0.485849
Observations	343	343	343	343	343

	Manager Bonus	Opt. # Cashiers	Urban	Interstate	New Hire Training Hours
Mean	$3,534.88	6.294461	0.480597	0.265672	567.0117
Median	$2,132.00	5	0	0	378
Maximum	$27,600.00	30	1	1	9503
Minimum	$0.00	0	0	0	0
Std. Dev.	$4,723.74	3.792598	0.500371	0.442351	688.3541
Observations	343	343	335	335	343

	Credit Card Charges	Average Gap	Firm Wage Gap
Mean	$9,687.78	$0.65	$1.29
Median	$6,878.00	$0.50	$1.00
Maximum	$103,853.00	$3.73	$4.80
Minimum	$0.00	-$6.06	-$6.00
Std. Dev.	$10,513.57	$0.80	$0.93
Observations	343	343	343

Appendix 2

Summary Statistics and Histogram for Cash Short

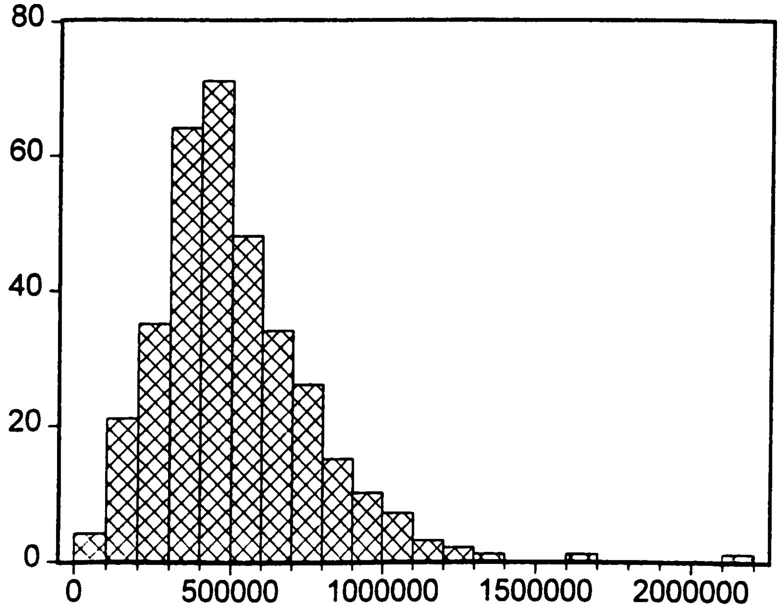


Series: CASH_SHORT
Sample 1 343
Observations 343

Mean	2531.501
Median	1393.000
Maximum	41379.00
Minimum	-2667.000
Std. Dev.	4145.932
Skewness	5.320513
Kurtosis	42.88404
Jarque-Bera	24352.55
Probability	0.000000

Appendix 3

Summary Statistics and Histogram for Big 8 Sales

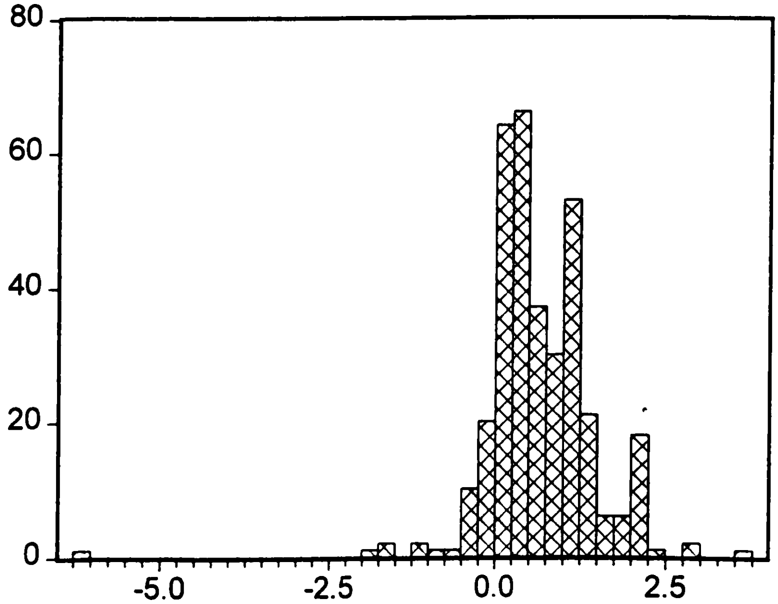


Series: BIG_8_SALES
Sample 1 343
Observations 343

Mean	512251.9
Median	453964.0
Maximum	2172226.
Minimum	15486.00
Std. Dev.	258254.4
Skewness	1.521347
Kurtosis	8.584952
Jarque-Bera	578.0932
Probability	0.000000

Appendix 4

Summary Statistics and Histogram for Average Wage Gap

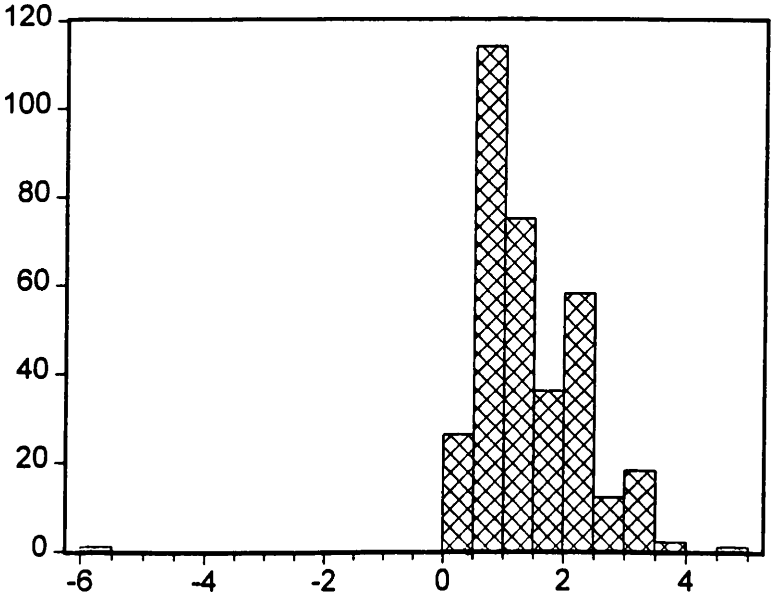


Series: AVE_GAP
Sample 1 343
Observations 343

Mean	0.646676
Median	0.500000
Maximum	3.730435
Minimum	-6.058929
Std. Dev.	0.797766
Skewness	-1.363484
Kurtosis	17.49973
Jarque-Bera	3110.990
Probability	0.000000

Appendix 5

Summary Statistics and Histogram for Firm's Wage Gap



Series: FIRM_WAGEGAP
Sample 1 343
Observations 343

Mean	1.293353
Median	1.000000
Maximum	4.800000
Minimum	-6.000000
Std. Dev.	0.929469
Skewness	-0.779113
Kurtosis	13.21188
Jarque-Bera	1525.071
Probability	0.000000

Appendix 6

Regression Results

Dependent Variable: LOG(CASH_SHORT)
Method: Least Squares
Date: 03/29/99 Time: 12:47
Sample: 1 343
Included observations: 307
Excluded observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.286149	0.287732	21.84727	0.0000
BIG_8_SALES	2.08E-06	6.24E-07	3.329146	0.0010
(BIG_8_SALES)^2	-9.29E-13	3.82E-13	-2.431188	0.0156
CASHIER_W2S	0.023759	0.007258	3.273232	0.0012
MANAGER_W2S	0.111528	0.045608	2.445382	0.0151
CASH_INCENT_PAY	-0.206485	0.138616	-1.489611	0.1374
MANAGERS_BONUS	-2.79E-05	1.43E-05	-1.943432	0.0529
OPTIMUM_CASHIERS	-0.019809	0.024924	-0.794791	0.4274
URBAN	0.101433	0.141781	0.715419	0.4749
INTERSTATE	0.134509	0.178253	0.754593	0.4511
N_H_TRAIN_HOURS	0.000160	8.63E-05	1.857408	0.0643
CREDITCARD_COST	1.42E-05	6.22E-06	2.290553	0.0227
AVE_GAP	0.534684	0.193771	2.759360	0.0062
FIRM_WAGEGAP	-0.644868	0.170563	-3.780810	0.0002

R-squared	0.280429	Mean dependent var	7.299117
Adjusted R-squared	0.248503	S.D. dependent var	1.125456
S.E. of regression	0.975646	Akaike info criterion	2.833096
Sum squared resid	278.9022	Schwarz criterion	3.003050
Log likelihood	-420.8802	F-statistic	8.783623
Durbin-Watson stat	1.829945	Prob(F-statistic)	0.000000

Appendix 7

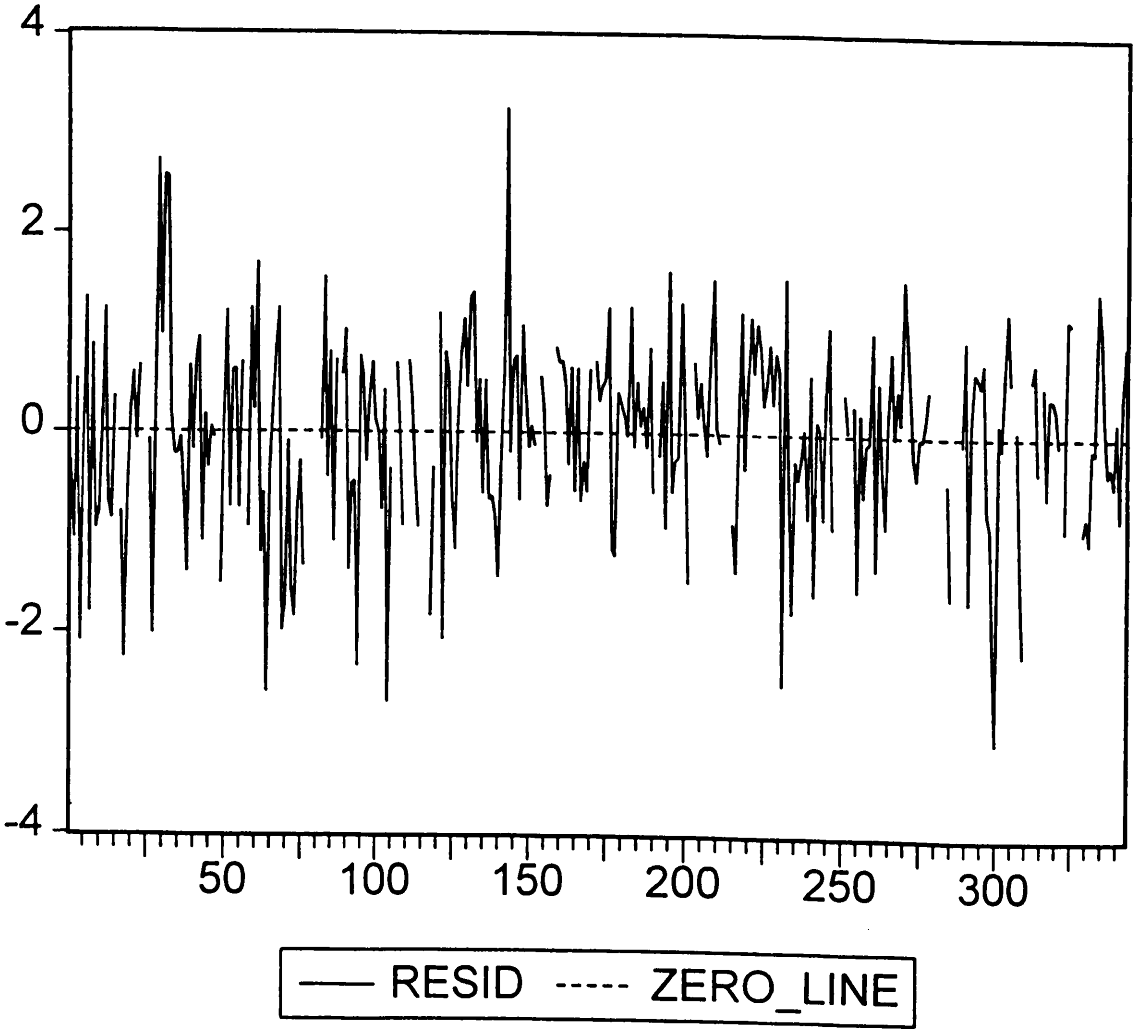
Correlation Matrix

	Cash Short	Big 8 Sales	(Big 8 Sales)^2	Cashier W2s	Manager W2s	Cashier Incentive Pay	Manager Bonus
Cash Short	1	0.186571	0.163303	0.203896	0.196042	-0.018485	-0.055077
Big 8 Sales	0.186571	1	0.923024	0.471119	0.26608	0.143232	0.421619
(Big 8 Sales)^2	0.163303	0.923024	1	0.48068	0.336763	0.08966	0.350915
Cashier W2s	0.203896	0.471119	0.48068	1	0.328331	-0.156776	-0.013185
Managers W2s	0.196042	0.26608	0.336763	0.328331	1	-0.105021	-0.005891
Cashier Incent Pay	-0.018485	0.143232	0.08966	-0.156776	-0.105021	1	0.412439
Managers Bonuses	-0.055077	0.421619	0.350915	-0.013185	-0.005891	0.412439	1
Opt # Cashiers	0.091915	0.50876	0.515367	0.718276	0.291882	-0.066999	0.028478
Urban	0.048794	0.024501	0.006632	0.018551	-0.150388	0.043186	-0.022078
Interstate	0.056225	0.026116	0.074677	0.083225	0.259292	-0.187744	-0.03061
New Hire Train Hours	0.15678	0.149874	0.112492	0.348726	0.120417	-0.062902	-0.089519
Credit Card Charges	0.111402	0.303486	0.247707	0.280429	0.129035	-0.02763	0.216611
Average Gap	0.00589	0.186606	0.164588	0.181277	0.201251	-0.082485	0.044377
Firm's Wag Gap	-0.060991	0.153785	0.142103	0.210678	0.190829	-0.223289	-0.011504

	Urban	Opt. # Cashiers	Interstate	Average Gap	Firm Wage Gap	New Hire Training Hours	Credit Card Charges
Cash Short	0.048794	0.091915	0.056225	0.00589	-0.060991	0.15678	0.111402
Big 8 Sales	0.024501	0.50876	0.026116	0.186606	0.153785	0.149874	0.303486
(Big 8 Sales)^2	0.006632	0.515367	0.074677	0.164588	0.142103	0.112492	0.247707
Cashier W2s	0.018551	0.718276	0.083225	0.181277	0.210678	0.348726	0.280429
Managers W2s	-0.150388	0.291882	0.259292	0.201251	0.190829	0.120417	0.129035
Cashier Incent Pay	0.043186	-0.066999	-0.187744	-0.082485	-0.223289	-0.062902	-0.02763
Managers Bonuses	-0.022078	0.028478	-0.03061	0.044377	-0.011504	-0.089519	0.216611
Opt # Cashiers	-0.088696	1	0.131411	0.239144	0.307285	0.275656	0.27908
Urban	1	-0.088696	-0.578583	-0.174077	-0.215382	-0.067134	-0.046585
Interstate	-0.578583	0.131411	1	0.180987	0.247929	0.103692	0.33898
New Hire Train Hours	-0.067134	0.275656	0.103692	0.046984	0.072125	1	0.13688
Credit Card Charges	-0.046585	0.27908	0.33898	0.19327	0.224362	0.13688	1
Average Gap	-0.174077	0.239144	0.180987	1	0.911093	0.046984	0.19327
Firm's Wag Gap	-0.215382	0.307285	0.247929	0.911093	1	0.072125	0.224362

Appendix 8

Plot of Regression Residuals



Appendix 9

White Heteroskedasticity Test:			
F-statistic	0.604888	Probability	0.919588
Obs*R-squared	13.74138	Probability	0.910403

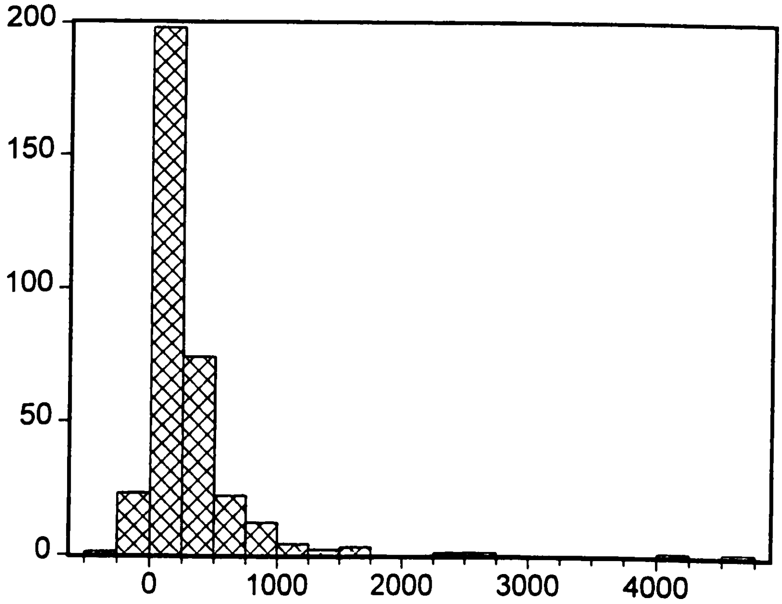
Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/17/99 Time: 16:53
Sample: 1 343
Included observations: 307
Excluded observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.776263	0.710254	1.092936	0.2753
BIG_8_SALES	1.92E-06	2.02E-06	0.949845	0.3430
BIG_8_SALES^2	-1.06E-12	1.86E-12	-0.571152	0.5683
((BIG_8_SALES)^2)^2	5.57E-26	3.10E-25	0.179987	0.8573
CASHIER_W2S	-0.013922	0.030981	-0.449371	0.6535
CASHIER_W2S^2	0.000106	0.000529	0.199644	0.8419
MANAGER_W2S	0.177588	0.212739	0.834769	0.4045
MANAGER_W2S^2	-0.028104	0.025354	-1.108442	0.2686
CASH_INCENT_PAY	-0.257776	0.224685	-1.147276	0.2522
MANAGERS_BONUS	-5.97E-05	6.51E-05	-0.917996	0.3594
MANAGERS_BONUS^	2.27E-09	2.73E-09	0.830161	0.4071
OPTIMUM_CASHIERS	-0.073404	0.095230	-0.770807	0.4415
OPTIMUM_CASHIERS	0.004085	0.004409	0.926597	0.3549
URBAN	0.136749	0.231709	0.590175	0.5555
INTERSTATE	0.356164	0.293632	1.212959	0.2262
N_H_TRAIN_HOURS	-0.000214	0.000302	-0.709355	0.4787
N_H_TRAIN_HOURS^	2.04E-08	3.75E-08	0.543065	0.5875
CREDITCARD_COST	-1.88E-06	1.92E-05	-0.097901	0.9221
CREDITCARD_COST^	7.23E-12	2.35E-10	0.030746	0.9755
AVE_GAP	0.303510	0.353325	0.859012	0.3911
AVE_GAP^2	0.140386	0.190068	0.738611	0.4608
FIRM_WAGEGAP	-0.146372	0.471757	-0.310270	0.7566
FIRM_WAGEGAP^2	-0.089088	0.156822	-0.568082	0.5704

R-squared	0.044760	Mean dependent var	0.908476
Adjusted R-squared	-0.029237	S.D. dependent var	1.488954
S.E. of regression	1.510564	Akaike info criterion	3.734807
Sum squared resid	648.0323	Schwarz criterion	4.014017
Log likelihood	-550.2929	F-statistic	0.604888
Durbin-Watson stat	2.098371	Prob(F-statistic)	0.919588

Appendix 10

Summary Statistics and Histogram of Benefits

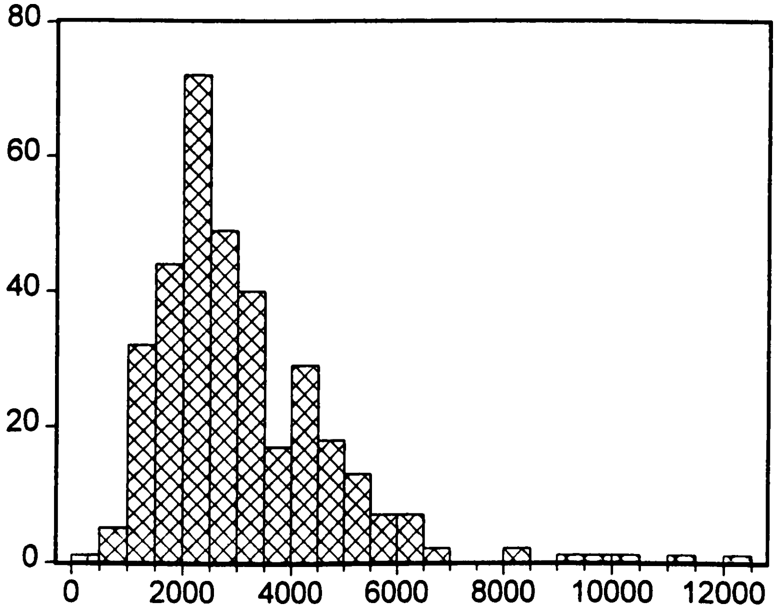


Series: BENEFIT
Sample 1 343
Observations 343

Mean	278.9310
Median	153.4863
Maximum	4559.304
Minimum	-293.8607
Std. Dev.	456.8154
Skewness	5.320513
Kurtosis	42.88404
Jarque-Bera	24352.55
Probability	0.000000

Appendix 11

Summary Statistics and Histogram of Costs

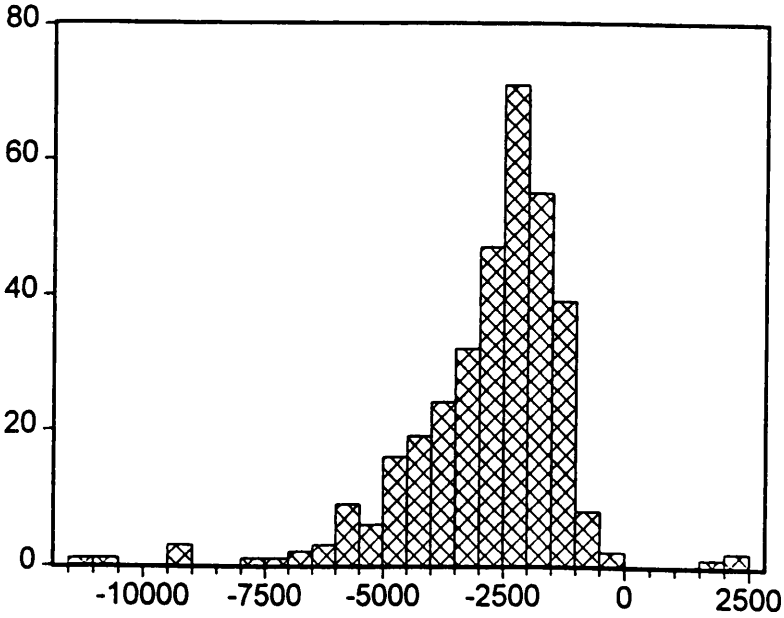


Series: COST
Sample 1 343
Observations 343

Mean	3081.589
Median	2666.875
Maximum	12289.12
Minimum	427.8750
Std. Dev.	1628.776
Skewness	1.895873
Kurtosis	8.966731
Jarque-Bera	714.2863
Probability	0.000000

Appendix 12

Summary Statistics and Histogram of Results



Series: RESULT
Sample 1 343
Observations 343

Mean	-2802.658
Median	-2464.146
Maximum	2200.645
Minimum	-11225.19
Std. Dev.	1628.086
Skewness	-1.543676
Kurtosis	8.293744
Jarque-Bera	536.7302
Probability	0.000000

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