DETERMINING DEMAND FOR HELP-WANTED ADVERTISING

by

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Abstract

The purpose of this thesis is to investigate how the price of advertising space affects the demand for help-wanted advertising. To do so, this thesis develops and estimates an econometric model to explain and predict the demand for help-wanted advertising placed in a newspaper. For the most part, economic theory and the literature suggest that basic economic and demographic factors explain the demand for help-wanted advertising. The literature and empirical studies confirm an inverse relationship exists between unemployment rates and help-wanted advertising. This thesis confirms these findings using firm specific data for a major metropolitan newspaper. Surprisingly few other studies explore whether the price for advertising is also an important determinant of demand. My model includes both unemployment data and average price of help-wanted ads and finds that price is an important determinant for the demand for help-wanted advertising. Closer scrutiny of these relationships should remove some of the uncertainty associated with what now appears to be a volatile demand.
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1. Introduction

Newspapers as a business have two main revenue streams; the actual sale of the newspaper known as circulation, and the sale of space in the newspaper to businesses and individuals who wish to reach certain segments of the population to convey an advertising message.

Although circulation does contribute a significant amount of revenue, the actual sale of an individual newspaper does not cover the variable costs of producing and distributing a newspaper such as *The Washington Post*. However, the circulation of the newspaper contributes to the demand for advertising. *The Washington Post* has a daily circulation of 786,032 and on Sunday a circulation over 1,075,918. This high circulation, that reaches a highly educated and affluent readership, is a draw to many advertisers.

Regardless, not all advertisers are created equal. Different segments of the advertising market may have different economic cycles increasing or decreasing in pro-cyclical or counter-cyclical fashion. For example Automotive and Recruitment (help-wanted) advertising generally increase as the economy expands, while Real Estate and Residential Rentals advertising increase as the economy contracts.

Newspaper advertising and marketing managers and directors prefer using rules of thumb, pro-forma models and trend analysis to make projections and decisions with respect to advertising. They generally do not employ econometric models to forecast advertising potential. One reason for this may be the scarcity of models that feature both forecast precision and sufficient decision levers to be practically useful. However, if such a model were available – one that could be used to project revenues and advertising and space, the value of such information might become more apparent.

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1 This is according to Hugh Price, Director of Operations and Planning at The Washington Post
2 The Washington Post Ad Book, p. 5
3 The Washington Post Market Book, p.6-7
Since help-wanted advertising is a major source of revenue for larger metropolitan newspapers, the purpose of this study is to examine various factors that explain the behavior of help-wanted advertisers and to develop a method to predict how that behavior can change. Using this method a newspaper can develop better strategies to maximize profits. In particular, newspaper managers may find it useful to better understand how pricing decisions along with economic conditions can affect the demand for advertising.

The thesis presents a Review of the Literature in Section 2. It expands on the Economic Theory and Model Design in Section 3. It then discusses the firm specific data used to test alternative hypotheses in Section 4 and the nature of multivariate regression analysis that provides the results of the study in Section 5. Section 6 follows with conclusions and recommendations for further study.
2. Review of the Literature

There are no published studies that provide estimates for the demand for help-wanted advertising in newspapers. However, there is a significant amount of literature that explores the relationship between help-wanted advertising as a proxy for vacancies and unemployment. The remainder of this section will discuss the literature as it pertains to the demand for help-wanted advertising. The two primary schools of thought are: first, that help-wanted advertising is a useful tool for predicting unemployment; second, that the relationship between help-wanted advertising and unemployment is too unstable to be much use in predicting unemployment.

2.1. Arguments Pro a Relationship between Help-Wanted and Unemployment

Cohen and Solow (1967) examine the relationship between the National Conference Board Help-Wanted Index (HWI)\(^4\) and unemployment. They constructed a model of the relationship between unemployment and help-wanted advertising in order to predict the change in what they term "normalized" help-wanted advertising. This normalization, NHWI, is simply the HWI divided by the civilian labor force.

Cohen and Solow (1967) explained that other factors besides the demand for labor determine the HWI. They also point out that advertising is a good just like any other good and that advertising trends should also be examined. Unfortunately, they did not include the price of advertising in their model.

\(^4\) The Conference Board collects help-wanted ad counts from one newspaper in each of 51 geographical areas, for a total of 51 newspapers. Data for each city are adjusted by separated day factors (to account for the number of weekdays and Sundays in a month) and to reflect the seasonal changes in hiring in each geographical area. The adjusted data is then divided by the number of ads in 1987--the base year. The indices are then multiplied by weights appropriate for each geographical area that reflects the nonagricultural employment in each. Regional and national indices are reached by summing the weighted indices. (Source: The Conference Board).
Cohen and Solow (1967) construct a model where the normalized Help-Wanted Index (NHWI) is the regressand (dependent variable) and new hires H in manufacturing per one hundred employed and unemployment rate U are the regressors. According to Cohen and Solow (1967) new hires and unemployment are equally good predictors of NHWI (when estimated separately), but have enough independent qualities to improve the explanation of the changes in help-wanted advertising. However, they do not explain what these qualities are or if they explored the possibility of multicollinearity.

Eqn. 2-1
\[ \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta U_t + \beta_2 \Delta H_t + e_{1t} \]

The deltas indicate they are estimating the change in the normalized Help-Wanted Index in relation to the change in unemployment and the change in new hires.

Since the residuals from the regression seem to be non-spherical, a dummy was added to reflect changes in the business cycle. The addition of the dummy improved the statistical significance.

Eqn. 2-2
\[ \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta U_t + \beta_2 \Delta H_t + \beta_3 D_t + e_{2t} \]

They found the relationship between unemployment and the normalized help-wanted index to be inverse and statistically significant.

Burch and Fabricant (1968) explore the reasons why the HWI showed a sharp increase in the second part of 1965. They say that this discrepancy between the behavior of help-wanted advertising and unemployment brings to question which is the better indicator of current conditions in the job market; help-wanted or unemployment. Their model becomes:

\[ \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta U_t \quad R^2 = .5632 \] and \[ \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta H_t \quad R^2 = .5558. \]

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5 The zero regressions are: \( \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta U_t \quad R^2 = .5632 \) and \( \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta H_t \quad R^2 = .5558. \)
Eqn. 2-3  \[ HWI_t = \beta_0 + \beta_1 G_t + \beta_2 (1/U) + e_{3t} \]

where \( G_n \) is the rate of growth of non-farm payroll employment and \( U \) is the unemployment rate. The rate of growth of non-farm payroll employment is used in conjunction with the unemployment rate as determinants of changes in the HWI. They interpret the HWI as a measure of all ads in a newspaper. They estimate Equation 2-3 for several periods and reject the hypothesis of no structural changes.

Using Chow tests they conclude that a structural change occurred at the end of 1957 (using data from 1951 though 1966). The structural change seemed to cause a jump in help-wanted advertising in relation to unemployment after 1957. Theories abound as to why this occurred. One explanation is that unemployment advertising in newspapers may be skewed toward job listings for white-collar work. As white collar work became more prevalent during the post 1957 period, the old relationships between non-farm payroll employment and the unemployment rate and, in turn, the HWI changed.\(^6\) Burch and Fabricant (1968) also conclude that the relationship between help-wanted advertising and unemployment is stable, inverse, and statistically significant.

Cohen, M. and Solow (1970) reply to the two articles written by Burch and Fabricant (1969) and Gujarati (1969). In both cases the results from the papers implied an unstable relationship between unemployment and help-wanted advertising—Burch and Fabricant only thought it to be unstable in 1957. Cohen and Solow (1970) point out their research was on the change of help wanted advertising index and the papers written examining levels of the HWI are misleading. Cohen and Solow (1970) use tests suggested by Burch and Fabricant (1968) and Gujarati (1969), respectively when they estimate Eqn. 2-4.

\(^6\) The Washington D.C. metropolitan area ranks first in the country for white-collar workers, 77% of the labor force. (Source The Washington Market Book, p. 10)
Eqn. 2-4  \( \Delta \text{NHWI}_t = \beta_0 + \beta_1 \Delta U_t + \beta_2 \Delta H_t + \beta_3 D_t + \beta_4 Z_t \Delta U_t + \epsilon_{4t} \)

where \( U \) is the unemployment rate, \( H \) is the number of new hires in manufacturing, \( D \) is a dummy that accounts for changes in the business cycle, and \( Z \) is a dummy that takes on the value of 1 after 1957. They found that \( Z_t \Delta U_t \) was not statistically significant or change the other coefficients to any extent.

To test for the stability for the change in unemployment during nine business cycles Cohen and Solow (1970) then added eight dummy variables to the model. They only found the beginning of a shift in 1955. They maintain that their original model showed that the relationship between the change in unemployment and the change in NHWI is indeed stable. Given the other variables in their model remain constant, they conclude unemployment is a good predictor of NHWI.

Burch and Fabricant, (1971) responded to Damodar Gujarati (1969) who concluded that the relationship between HWI and unemployment was not stable and could not be used for demand prediction. They authors disagree with Gujarati while conceding that the HWI is an imperfect indicator of unemployment due to different factors that change the supply and demand for labor. Their main criticisms of Gujarati's research is that he left out what Burch and Fabricant think to be important demand variables for labor and his selection of time periods for the cycle phases were arbitrary. Therefore, Burch and Fabricant (1971) reject Gujarati's (1969) research.

Krug Friedman (1982) used data from Phoenix for her model, in which she set up and estimated the following equations:

Equation 2-5a  \[ \text{LN}(\text{HWI}_{t-4}) = \beta_0 + \beta_1 \text{LN}(E_t) + \mu_{1a} \]

Equation 2-5b  \[ \text{LN}(\text{HWI}_{t-2}) = \beta_0 + \beta_1 \text{LN}(U_t) + \mu_{1b} \]
Where HWI is the Help-Wanted Index, E is employment and U is unemployment. The Help-Wanted Index, employment and unemployment are expressed as natural logs and $\mu_{ta} = \rho a^* \mu_{ta-1} + \nu a_t$ and $\mu_{tb} = \rho b^* \mu_{tb-1} + \nu b_t$.

The author found that a four-month lagged help-wanted index had a statistically significant relationship with present month employment; two months for unemployment.

Abraham (1987) maintains that the relationship between help-wanted advertising and unemployment has changed in post 1970 because the number of help-wanted ads has moved upwards relative to job vacancies. She cites several reasons for the apparent increase in help-wanted advertising:

(1) EEO affirmative action laws
(2) white collar work is advertised more often than blue collar,
(3) competition among newspapers has declined increasing circulation.

Abraham maintains her empirical research shows that even after adjusting for these factors there is still a shift in the unemployment/help-wanted index. However, even though the relationship has changed, it is still a useful indicator of job vacancies.

Hannah (1983) looks at various equations dealing with the relationship between the unemployment rate and the help-wanted index. Hannah finds that the model that best represents the relationship is:

Eqn. 2-6. $\ln U_{\text{empt}} = \beta_0 + \beta_1 \ln U_{\text{empt}} t_{-1} + \beta_2 \ln \text{HWI}_t + \beta_3 \ln \text{HWI}_t_{-1}$.

Where $U_{\text{empt}}$ is the level of unemployment as a percentage of the civilian labor force and HWI is the help-wanted index. Note how the HWI now becomes a regressor and the Normalized Unemployment becomes a Regressand! Per Hannah (1983) this is a non-stationary model. Meaning that the variables in the regression contain a time trend.7

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7 Kennedy, p. 265
2.2. Arguments Con a Relationship between Help-Wanted and Unemployment

Gujarati (1969) disputes the findings of Cohen and Solow (1967) and Burch and Fabricant (1968). His main thesis is that business fluctuations were not taken into account in the earlier studies. His model showed that there was instability of the parameters between expansions and contractions and from one expansion to another. His conclusion cast doubt on any relationship between help wanted advertising and unemployment.

His basic model where HWI is the Help-Wanted Index and U is unemployment is as follow:

Eqn. 2-7a
\[ \text{HWI} = a + b \left( \frac{1}{U} \right) \]

His addition to this model is his compensation for business cycles:

Eqn. 2-7b
\[ \text{HWI} = a_1 + a_2D_2 + a_3D_3 + a_4D_4 + a_5D_5 + a_6D_6 + a_7D_7 + a_8D_8 + a_9D_9 \\
+ a_{10}D_{10} + b_1(1/U_1) + b_2(1/U_2) + b_3(1/U_3) + b_4(1/U_4) + b_5(1/U_5) + b_6(1/U_6) + b_7(1/U_7) + b_8(1/U_8) + b_9(1/U_9) + b_{10}(1/U_{10}) \]

The D's stand for the differential intercept dummies (1 or 0) for periods one through ten, the U's stand for the unemployment rates for periods one through ten, and the b coefficients are the estimates of the slopes during the time period specified. Gujarati (1969) derived the ten periods by taking quarterly information from the first quarter of 1951 to the second quarter of 1968, which produced seventy observations. He then divided the seventy observations into ten periods.

His statistical results varied substantially from time period to time period. He concluded that the relationship between unemployment and the Help-Wanted Index had questionable if any predictive quality.

Cohen and Solow, Burch and Fabricant, Abraham, and Hannah et. al. may disagree on equation structure but suggest that HWI appears to be related to both E and U. They refute the Gujarati (1969) findings that the parameters are sufficiently
stable to estimate and reject Gujarati’s conclusion that no relationship exists between help wanted advertising and unemployment.

A decade after Gujarati’s work, armed with an interest in co-integration and the benefits of a decade of time-series analysis econometric advances Warren (1980) rejects earlier studies that uses the Help-Wanted Index (HWI) as a proxy for vacancies. He maintains this method of regressing the HWI on unemployment rates is flawed because it employs steady assumptions on a non-stationary data generation process. Basically he is saying that it is wrong to estimate a relationship between the HWI and unemployment as they themselves are influenced by a process that consists of job searching and employment turnover.

The author constructs a model he believes is superior using a data set of U.S. manufacturing vacancies collected from 1969 through 1973 by the Bureau of Labor Statistics (BLS). His model cannot be extended because this data is no longer collected.

The model is as follows:  \( V = \text{vacancies}, U = \text{the level of unemployment}, E = \text{the level of employment}, J = \text{the job stock which is the number of available jobs} \) and \( L = \text{the labor force} \). He uses three accounting identities:

1. Eqn. 2-8a  \[ V_t = J_t - E_t \]
2. Eqn. 2-8b  \[ U_t = L_t - E_t \]
3. Eqn. 2-8b  \[ E_t = \Delta E - E_{t-1} \]

Warren uses the following econometric equation to explain the percent changes in employment. His final equation becomes:

\[
\Delta E/E_{t-1} = \alpha_0 + \alpha_1(U/E)_{t-1}^{1/2} (V/E)_{t-1}^{1/2} + \alpha_2T + t + \eta_t
\]

where \( T \) time(1,2,3,...,T) and \( \eta_t \) is the error term.
He reports that his signs are as expected and that they are statistically significant. His time trend is positive and also statistically significant.

Although he takes issue with previous studies, he admits that his data series (44 observations) for vacancies is too small to make comparisons to Cohen and Solow (1967), Burch and Fabricant (1968), and Gujarati (1969).

2.3 End Note

Most of the studies reviewed confirm that help-wanted advertising is inversely related to unemployment. However all the literature except Warren (1980) studies the relationship using the Help-Wanted Index as a proxy for job vacancies. The only objective of this thesis is to estimate the level of help-wanted inserts; whether it is an imperfect indicator of job vacancies is not a concern of this paper. Therefore, although the literature serves as a springboard to understanding the methods of measuring the behavioral relationships that influence help-wanted advertising, this thesis is unconcerned with the question of whether or not help-wanted advertising is a proxy for vacancies. Rather it focuses on the determinants for the HWI and demand of help wanted advertising.

Additionally, the literature is limited in that it does not take the price of help-wanted advertising into consideration. However, since this information is proprietary in nature, it is unlikely that this factor could be explored in past studies due to the unavailability of the data.
3. Economic Theory/Model

3.1 Demand for Help-Wanted Ads

Economic theory tells us that the quantity demanded of any good is related inversely to price, other things being equal. Help-wanted advertising is a commodity that has a demand determined by employers in the marketplace. Advertisers can and do alter the amount of lines per ad as well as number of ads. Although internet-based recruiting entities such as monster.com have grown in recent years, employers have continued to use newspapers as a major source for posting vacant positions. In a study conducted by Salomon Smith Barney in 2001, online help-wanted advertising accounted for 2.7% of total recruitment dollars in 1999, 6.1% in 2000 and was projected to take 11.6% of total recruitment dollars for 2001. According to this study, online advertising is becoming an economic substitute for newspaper help-wanted advertising. As such, the price of advertising becomes more of a factor than during the pre-internet era.

Newspaper-level demand for help-wanted advertising derives from the demand of individual companies who potentially could advertise in a newspaper. Company demand can have many factors: immediacy of need, skill/education level of workers desired, etc. Substitutes have not been a factor; but that situation is beginning to change. The Salomon Smith Barney study suggests that online advertising is beginning to become an economic substitute for newspaper help-wanted advertising. As such the price of advertising becomes more of a factor than during the pre-internet era. This thesis does not test for changes in cross price elasticity because the internet is still a small piece of the recruitment advertising pie. It is an interesting subject, but there is no reliable data available at this time.

Advertisers also use campus recruiting and job fairs to attract potential laborers. However, these methods attract only slivers of the potential pool of

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8 Per Salomon Smith Barney p. 5
candidates desired by companies. Only newspapers, for the most part, have delivered the large audience desired by labor seeking firms, with online gaining prominence.\(^9\)

Other factors can cause the demand to shift.\(^{10}\) As the literature review demonstrates, unemployment is a key determinant for help-wanted advertising. When unemployment is high, employers advertise less. When the labor market is tight employers increase advertising.

### 3.2 Supply of Help-Wanted Ads

The supply of newspaper advertising space is perfectly elastic\(^{11}\). Newspaper normally will add sections as needed and will take all advertising demanded at the price it establishes.

As Figure 1 illustrates, the quantity of ad space supplied will accommodate a change in the unemployment rate which shifts demand. Entry of a substitute such as the internet will make the demand curve more elastic.

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\(^9\) Saloman Smith Barney p. 5  
\(^{10}\) Denzau, p.200  
\(^{11}\) In theory it could be said it is finite as presses are designed to print a certain volume of newsprint. However, press capacity is not an issue.
3.3 Model

The goal of this thesis is to construct a model that will estimate and explain how the demand for help-wanted ads placed in a newspaper may change. The explanatory variables of the basic model are the average price of help-wanted advertising in *The Washington Post* and the unemployment data for the Washington DC metropolitan area as obtained from the Bureau of Labor Statistics. Seasonal dummies are used to account for the seasonal nature of help-wanted advertising. I assume that the quantity of advertising ads demanded is stochastic and conditional upon price and unemployment information.

Only demand for advertising will be estimated. Supply of help-wanted advertising is assumed to be infinitely elastic because I assume *The Washington Post* will print as many ads as demanded at the price charged.
3.4 Basic Equations

I will estimate two sets of equations. All data is monthly. The first two equations are as follows:

Eqn. 3-1 \[ \ln(HWI_t) = \alpha_0 + \alpha_1 \ln(P_t) + \alpha_2 \ln(U_t) + \delta_1 D_{1t} + \delta_2 D_{2t} + \delta_3 D_{3t} + \mu_t \]

Where HWI is the Conference's Board Help-Wanted Index for Washington, DC, Pt is the average price of help-wanted advertising per line, Ut is the number of unemployed as measured monthly by the BLS and the Dt variables are dummies accounting for spring, summer, and fall. \( \mu_t \) is the error term and \( \delta \)s and \( \alpha \)s are coefficients. For the time being I assume that \( \mu_t \sim \text{IN}(0,\sigma_\mu^2) \).

The second equation uses the actual number of ads printed by *The Washington Post*.

Eqn. 3-2 \[ \ln(POST_t) = \beta_0 + \beta_1 \ln(P_t) + \beta_2 \ln(U_t) + \gamma_1 D_{1t} + \gamma_2 D_{2t} + \gamma_3 D_{3t} + \epsilon_t \]

All of the independent variables are the same as in equation 3-1. Only the dependent variable has changed. POST is the actual number of ads printed by *The Washington Post* as provided to the Conference Board. \( \epsilon_t \) is the error term and \( \beta \)s and \( \gamma \)s are coefficients. For the time being I assume that \( \epsilon_t \sim \text{IN}(0,\sigma_\epsilon^2) \).

The reasoning behind performing separate regressions using both the Conference Board's Help-Wanted Index and another using the data provided by *The Washington Post* is very simple. Since the Help-Wanted Index is an index that is adjusted for various factors, seasonality, the number of Sundays in a month, and non-farm employment in relationship to other cities\(^\text{12}\), and the other data including the independent variables, is *not* adjusted, a comparison between regressions using the Help-Wanted Index and the raw data from *The Washington Post* seems warranted.

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\(^{12}\) Per Conference Board, p. 1
Actual number of ads printed is not made public by any newspaper and the second equation is technically more appropriate. However for completeness and comparison purposes, the estimation of the first equation is consistent with the aforementioned literature. All previously mentioned studies only had access to Help-Wanted Index data, therefore, I decided to estimate Eqn. 3-1 using the same dependent variable as other studies. This facilitates comparisons and helps to draw additional inferences as to the limitations of indices as dependent variables.

The independent variables were chosen for their perceived predictive value. Unemployment figures are readily available from the Bureau of Labor Statistics. Additionally, virtually all economic research done in this area uses unemployment as an independent variable. The lower the unemployment rate, the tighter the job market, the more employers will have to advertise to let prospective employees know their company is hiring.

Because prices for advertising were available, price becomes an obvious choice as an independent variable. Like unemployment we assume it too is exogenous for purposes of estimating Eqn. 3-1 and 3-2. Price also allows the analyst to estimate the marginal revenue of additional advertising and the elasticity of demand for advertising. Actual price was not used in the literature reviewed. Monthly average price per ad line was available from The Washington Post for this thesis.

Dummies variables account for seasonality and in all those variables that were not seasonally adjusted. The dependent and independent variables are assumed to be time specific – the dependent and independent variables occur in the same time period t, although variations of these equations were considered in which the regressors were lagged to capture any latent dynamic effects of either prices or unemployment on the demand for advertising. I chose a one month, a two month, and a three month lag as The Washington Post's advertising and marketing managers evaluate performance on a quarterly basis. For this reason, I included lags within one
quarter to provide a snapshot look at the effect one quarterly business period has on the demand for help-wanted advertising.
4. Data and Empirical Considerations

The following section describes and explains the actual data used in the non-lagged and lagged equations. The dependent variables Help-Wanted Index and Post data do not change between the first set of equations and the second. Data are monthly from January 1994 through November 2001 for a total of 95 observations for the non-lagged data. Lagging the independent variables on present HWI and POST data decreases the observations on all the variables regressed by one for the one-month lagged equation, two for the two-month lagged equation and three for the three month lagged equation.

4.1. Dependent Variables

The Conference Board collects help-wanted ad counts from one newspaper from each of fifty-one geographical areas to create a seasonally adjusted weighted index of each area and the nation as a whole.\(^{13}\)  It is generally recognized as an early indicator of the hiring plans of employers; the index and unemployment have been observed to have a negative relationship.\(^{14}\)

HWI is the Help-Wanted Index as provided by the Conference Board. Data used is the index for the Washington DC metropolitan area.  Per the Conference Board (2001) the HWI is a weighted index of help-wanted inserts that account for seasonal changes and the fact that year to year some months may have more Sundays (the biggest day for help-wanted advertising) than others. This adjusted data is then in turn divided by the number of adjusted ads for 1987 which is the base year. The index is then multiplied by a weight, which reflects the non-farm employment for

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13 Per Conference Board, p.1  Additional information taken from their website, www.conferenceboard.org
14 Frumpkin, p.164-65
each city measured (51 cities). Regional and national indices are calculated by adding up the weighted indices of the individual cities.\textsuperscript{15}

POST is the actual raw data provided by The Washington Post to the Conference Board to construct the Help-Wanted Index. This is monthly\textsuperscript{16} data collected by the Advertising Budget Unit of The Washington Post and is now e-mailed to the Conference Board. The data is the number of in-paper (as opposed to online or other products not considered to be part of the main newspaper) help-wanted ads.

Both the HWI for the Washington DC area and the raw data from The Washington Post should and do have the same signs and move in the same direction in relation to unemployment and price. However, since all previous studies only had the HWI data, I thought it was worthwhile since I have access to the proprietary data to compare the results of separate regressions.

Cohen and Solow (1967) normalized the HWI (dividing it by the civilian labor force) to account for to correct for the growth of the economy. However, they used the HWI as a proxy for vacancies while this thesis is only interested in help-wanted advertising as a commodity. Therefore, this "normalization" is not necessary for this study.

4.2 Independent Variables

In the first set of equations P represents the average price of in-paper help wanted advertising from The Washington Post. Since historical prices were not available explicitly, I derived them by dividing in-paper help-wanted revenue by the number of lines of each month. This average price per line per month serves as an

\textsuperscript{15} Conference Board, p. 1
\textsuperscript{16} The Washington Post uses periods as time frames instead of months. It is essentially the same except that a period may start a day or two before an actual month to account for the same quantity of Sundays year over year. Since the HWI uses a weight to accomplish this they may be overcompensating in the case of The Washington Post.
index of the price of help-wanted advertising for *The Washington Post*. I assume that the main reason average price per line was not in the equations listed in the literature review is that it is not made public. This thesis takes advantage of the availability of this data.

U represents number of unemployed for the Washington, DC metropolitan area as collected by the Bureau of Labor Statistics (BLS).\(^\text{17}\) This data is collected monthly.

D\(_1\), D\(_2\), D\(_3\) are dummies representing Spring, Summer and Fall respectively. 1 represents said respective season. 0 is use to represents the season omitted-winter. The three dummy coefficients represent the differences from winter, a time when help-wanted advertising slacks off. The dummies are deemed as necessary in both the HWI regressions and the POST regressions due to the fact that although the HWI is seasonally adjusted, the independent variables are not.

In the second set of equations the independent variables do not change. Both average price of help-wanted ads (P) and unemployment (U) are lagged by one month and in turn, by two and three months.

New hires in manufacturing was an independent variable introduced by Cohen and Solow (1969) to their model. They added this variable to counteract what they perceived to be symmetry between the NHWI and unemployment. I did not feel that using two measures of employment were necessary for this thesis as unemployment is more than a sufficient measure of labor market ease or tightness. Indeed, using two measures that are related to each other may actually result in multicollinearity which is not addressed in the Cohen and Solow studies.

\(^{17}\) The following areas were chosen to represent the Washington DC area:
DISTRICT OF COLUMBIA, WASHINGTON, DC-MD-VA-WV PMSA, PRINCE WILLIAM COUNTY, VA, FAIRFAX CITY, VA, FALLS CHURCH CITY, VA, MANASSAS CITY, VA, MANASSAS PARK CITY, VA, CHARLES COUNTY, MD, LOUDOUN COUNTY, VA, FAIRFAX COUNTY, VA, MONTGOMERY COUNTY (INCLUDES TOTALITY OF TOKOMA PARK CITY), MD, PRINCE GEORGES COUNTY (EXCLUDES TAKOMA PARK PART), MD, ALEXANDRIA CITY, VA, ARLINGTON COUNTY, VA, MARYLAND PORTION OF WASHINGTON, DC-MD-VA-WV PMSA, VIRGINIA PORTION OF WASHINGTON, DC-MD-VA-WV PMSA.
Gujarati (1969) used dummies to account for the business cycle. Again, since I am only estimating help-wanted advertising as a commodity and not a proxy for vacancies, I believe that unemployment and price are the two factors to emphasize. According to a Soloman Smith-Barney study (2001), the relationship between help-wanted ads and unemployment is very strong and inverse. Their study found that the unemployment rate accounts for 91% of the change in help-wanted ads. Therefore, I do not believe any other measure of the general economy is warranted, as unemployment should account for the state of the economy as it pertains to help-wanted advertising.

4.3 Estimation Method

Except for the dummies, both the dependent and independent variables were transformed to natural logs. The resulting estimated coefficients produced by the regression are elasticities. I estimated the equations using Ordinary Least Squares (OLS). This assumes that the error terms have an expected value of zero.
5. Results

5.1 First Set of Equations-Non-lagged equations

Help-Wanted Index as Dependent Variable

The first equation looks at the relationship between the Help-Wanted Index, average price of advertising, unemployment and dummies added to account for seasonal disturbances because although HWI is seasonally adjusted, price and unemployment are not.

Eqn. 5-1a

\[ \ln(\text{HWI}_t) = \alpha_0 + \alpha_1 \ln(P_t) + \alpha_2 \ln(U_t) + \delta_1 D_{1t} + \delta_2 D_{2t} + \delta_3 D_{3t} + \mu_t \]

A regression with 95 observations yield the following results:

Table 1

<table>
<thead>
<tr>
<th>SUMMARY OUTPUT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regression Statistics</strong></td>
<td></td>
</tr>
<tr>
<td>Multiple R</td>
<td>0.568652041</td>
</tr>
<tr>
<td>R Square</td>
<td>0.32</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.29</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.115659252</td>
</tr>
<tr>
<td>Observations</td>
<td>95</td>
</tr>
</tbody>
</table>

| Durbin-Watson | 0.673567106 |
| Autocorrelation |  |

<table>
<thead>
<tr>
<th>ANOVA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>df</td>
<td>SS</td>
</tr>
<tr>
<td>Regression</td>
<td>5</td>
</tr>
<tr>
<td>Residual</td>
<td>89</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>11.46317419</td>
<td>1.361240319</td>
</tr>
<tr>
<td>Price</td>
<td>-0.556543738</td>
<td>0.113844049</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.550880079</td>
<td>0.100507581</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>-0.060946968</td>
<td>0.033899663</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>-0.041986120</td>
<td>0.034890656</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>-0.075783549</td>
<td>0.034115465</td>
</tr>
</tbody>
</table>

critical value at \( t_{0.05} \)

1.66
Price and unemployment are negative as expected, the t statistics are significantly significant at the 95% confidence level for price and unemployment. The dummies for spring, summer, and fall are all negative; however, the coefficients are very small and the summer dummy is not statistically significant. The F-stat is also statistically significant at the 95% confidence level and the Durbin-Watson indicates autocorrelation.

Since this is a log function, price and unemployment coefficients are the elasticities of demand for those variables. Own price elasticity is 0.56 meaning Help-Wanted Index should change 0.56% in for every 1% change in price. Unemployment elasticity is 0.55 meaning the Help-Wanted Index should change 0.55% in for every 1% change in unemployment.

**Post Data as Dependent Variable**

Eqn. 5-1b  
\[ \text{LN}(\text{POST}_t) = \beta_0 + \beta_1 \text{LN}(P_t) + \beta_2 \text{LN}(U_t) + \gamma_1 D_{1t} + \gamma_2 D_{2t} + \gamma_3 D_{3t} + \varepsilon_t \]

Where POST is the number of in paper help wanted ads as provided to the Conference Board by The Washington Post, P is the average price of help-wanted ads, U is unemployment as measured monthly by the BLS, the D variables are dummies accounting for Spring, Summer, and Fall and \( \varepsilon_t \) is the error term.
Again the price and unemployment are negative as expected. The t-stats are statistically significant at the 95% confidence level for all variables except for the last dummy variable. The F-stat is higher than the critical value so it is recognized as statistically significant. The Durbin-Watson statistic shows no autocorrelation.

Own price elasticity is .38 which means help-wanted inserts, should change .38% for every 1% change in price. Unemployment elasticity is .36 which means help-wanted inserts should change .36% in for every 1% change in unemployment.
In this equation, the dummies for Summer, Spring and Fall are positive and statically significant which indicates that more advertising is place during these seasons than winter.

5.2 Second Set of Equations - Lagged Equations

Help-Wanted Index as Dependent Variable

The next two equations look at the relationship of lagging the independent variables to examine if the amount of advertising demanded follows a lag of price and level of unemployment. I decided to lag the independent variables by one quarter in one month increments to see if the statistical results would improve as it usually takes a period of time for a reaction.\(^{18}\)

Eqn. 5-2a. \[ \ln(\text{HWI}_t) = \alpha_0 + \alpha_1 \ln(P_{t-1}) + \alpha_2 \ln(U_{t-1}) + \delta_1 D_{1t} + \delta_2 D_{2t} + \delta_3 D_{3t} + \mu_t \]

Eqn. 5-2b. \[ \ln(\text{HWI}_t) = \alpha_0 + \alpha_1 \ln(P_{t-2}) + \alpha_2 \ln(U_{t-2}) + \delta_1 D_{1t} + \delta_2 D_{2t} + \delta_3 D_{3t} + \mu_t \]

Eqn. 5-2c. \[ \ln(\text{HWI}_t) = \alpha_0 + \alpha_1 \ln(P_{t-3}) + \alpha_2 \ln(U_{t-3}) + \delta_1 D_{1t} + \delta_2 D_{2t} + \delta_3 D_{3t} + \mu_t \]

Where HWI is the Help-Wanted Index. \( P_{t-1} \) is the natural log of the average price of help-wanted advertising lagged one month, \( P_{t-2} \) indicates a two-month lag and \( P_{t-3} \) indicates a three-month lag. \( U_{t-1} \) is the natural log of unemployment lagged one month, \( U_{t-2} \) indicates a two-month lag and \( U_{t-3} \) indicates a three-month lag. \( D_1 \) is the dummy for spring, \( D_2 \) is the dummy for summer and \( D_3 \) is the dummy for fall.

\(^{18}\) Rutherford p. 261
### Table 3

<table>
<thead>
<tr>
<th>HWI</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>11.05523382</td>
<td>1.489379878</td>
<td>7.422709265</td>
</tr>
<tr>
<td>Price</td>
<td>-0.5641205</td>
<td>0.125833546</td>
<td>-4.483069239</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.514027916</td>
<td>0.109485494</td>
<td>-4.694940849</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>-0.034745017</td>
<td>0.035462805</td>
<td>-0.979759421</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>-0.035947201</td>
<td>0.037369916</td>
<td>-0.961928869</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>-0.059700397</td>
<td>0.036704512</td>
<td>-1.626513847</td>
</tr>
</tbody>
</table>

**One Month**

- **R Square**: 28%
- **Adjusted R Square**: 24%

**Significance F**: 6.953683602

Critical Value: 1.62716E-05

**F Value** at critical value for t.05:

1.6649 at 1.62716E-05

### Two Month

<table>
<thead>
<tr>
<th>HWI</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>10.1198149</td>
<td>1.655419666</td>
<td>6.113141646</td>
</tr>
<tr>
<td>Price</td>
<td>-0.5287366</td>
<td>0.142329</td>
<td>-3.71489016</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.438615255</td>
<td>0.120726516</td>
<td>-3.63313051</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>-0.01199331</td>
<td>0.038811392</td>
<td>-0.309015193</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>-0.063214699</td>
<td>0.038454351</td>
<td>-1.64389388</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>-0.057806992</td>
<td>0.039928484</td>
<td>-1.447763254</td>
</tr>
</tbody>
</table>

**Significance F**: 5.147854137

Critical Value: 0.000348807

**F Value** at critical value for t.05:

1.66471 at 0.000348807

### Three Month

<table>
<thead>
<tr>
<th>HWI</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>8.616261066</td>
<td>1.872106657</td>
<td>4.602441338</td>
</tr>
<tr>
<td>Price</td>
<td>-0.425490448</td>
<td>0.158500224</td>
<td>-2.684478527</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.325476313</td>
<td>0.1358779</td>
<td>-2.395358715</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>-0.04883009</td>
<td>0.039467516</td>
<td>-1.237222262</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>-0.104203276</td>
<td>0.03932895</td>
<td>-2.649531134</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>-0.079758125</td>
<td>0.040871773</td>
<td>-1.951423165</td>
</tr>
</tbody>
</table>

**Significance F**: 3.466649901

Critical Value: 0.006674862

**F Value** at critical value for t.05:

1.66493 at 0.006674862
Price and unemployment are negative as expected in all three regressions. However the dummies are negative as in the first non-lagged equation using HWI as the dependent variable. Additionally, the dummies do not have t-stats that are statistically significant at the 95% confidence level.

However, price and unemployment have t-stats that are statistically significant in all three regressions. The interesting point in this exercise is that as the lag increases, price becomes more a factor in relation to unemployment as the coefficient becomes larger in relationship to the coefficient for unemployment. This would indicate that price becomes more of a factor as advertisers have time to react to a change in price.

**Post Data as Dependent Variable**

The second part of this exercise is to see how lagging price and unemployment affects the Post Data, the number of actual inserts of help-wanted advertising. The following equations addresses this question.

\[
\text{Eqn. 5-2d} \quad \ln(\text{POST}_t) = \beta_0 + \beta_1 \ln(P_{t-1}) + \beta_2 \ln(U_{t-1}) + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \epsilon_t
\]

\[
\text{Eqn. 5-2e} \quad \ln(\text{POST}_t) = \beta_0 + \beta_1 \ln(P_{t-2}) + \beta_2 \ln(U_{t-2}) + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \epsilon_t
\]

\[
\text{Eqn. 5-2f} \quad \ln(\text{POST}_t) = \beta_0 + \beta_1 \ln(P_{t-3}) + \beta_2 \ln(U_{t-3}) + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \epsilon_t
\]

Where POST is the number of actual help-wanted inserts. \( P_{t-1} \) is the natural log of the average price of help-wanted advertising lagged one month, \( P_{t-2} \) indicates a two month lag, \( P_{t-3} \) indicates a three month lag. \( U_{t-1} \) is the natural log of unemployment lagged one month, \( U_{t-2} \) indicates a two-month lag, and \( U_{t-3} \) indicates a three-month lag. The D's are the dummies for Spring, Summer and Fall.
Table 4

<table>
<thead>
<tr>
<th></th>
<th>One Month</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R Square</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjusted R Square</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td>Coefficients</td>
<td>Standard Error</td>
<td>t Stat</td>
</tr>
<tr>
<td>Intercept</td>
<td>17.32374094</td>
<td>2.686857427</td>
<td>6.447584741</td>
</tr>
<tr>
<td>Price</td>
<td>-0.577102512</td>
<td>0.22700508</td>
<td>-2.542244923</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.492491974</td>
<td>0.197513016</td>
<td>-2.49346592</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>0.192602482</td>
<td>0.063975284</td>
<td>3.010576419</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>0.216938945</td>
<td>0.067415733</td>
<td>3.217927528</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>0.141422217</td>
<td>0.066215337</td>
<td>2.135792438</td>
</tr>
<tr>
<td>F Significance F</td>
<td>3.309857668</td>
<td>0.008720064</td>
<td>1.66449 at critical value at t.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Two Month</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R Square</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjusted R Square</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td>Coefficients</td>
<td>Standard Error</td>
<td>t Stat</td>
</tr>
<tr>
<td>Intercept</td>
<td>17.15565669</td>
<td>2.891581367</td>
<td>5.932966952</td>
</tr>
<tr>
<td>Price</td>
<td>-0.607842651</td>
<td>0.248611208</td>
<td>-2.444952725</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.471380824</td>
<td>0.21087737</td>
<td>-2.235331484</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>0.223130036</td>
<td>0.067793261</td>
<td>3.291330615</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>0.198658404</td>
<td>0.067169604</td>
<td>2.957564021</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>0.153321210</td>
<td>0.069744527</td>
<td>2.19832604</td>
</tr>
<tr>
<td>F Significance F</td>
<td>3.007101893</td>
<td>0.014966518</td>
<td>1.66471 at critical value at t.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Three Month</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R Square</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adjusted R Square</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td>Coefficients</td>
<td>Standard Error</td>
<td>t Stat</td>
</tr>
<tr>
<td>Intercept</td>
<td>14.91142279</td>
<td>3.207684465</td>
<td>4.648656362</td>
</tr>
<tr>
<td>Price</td>
<td>-0.427161644</td>
<td>0.271575716</td>
<td>-1.57890735</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.309213964</td>
<td>0.232814422</td>
<td>-1.328156397</td>
</tr>
<tr>
<td>Dummy Spring</td>
<td>0.186003132</td>
<td>0.067623999</td>
<td>2.750549134</td>
</tr>
<tr>
<td>Dummy Summer</td>
<td>0.154765398</td>
<td>0.067386578</td>
<td>2.296679887</td>
</tr>
<tr>
<td>Dummy Fall</td>
<td>0.125169531</td>
<td>0.070030065</td>
<td>1.787368475</td>
</tr>
<tr>
<td>F Significance F</td>
<td>2.235331232</td>
<td>0.057930455</td>
<td>1.66493 at critical value at t.05</td>
</tr>
</tbody>
</table>
Again price and unemployment have a negative sign as expected. The F-stat is still statistically significant in all three regressions. The t-stats are statistically significant for price, unemployment, and the dummies in the one-month lag and the two-month lagged regressions. The dummies are positive in all regressions indicating that there is more advertising in those seasons than in the winter. Again as the lag increases, price becomes more of a factor, indicating that price becomes more of a consideration as advertisers have time to react. It seems that after two months, the lag becomes less statistically significant.
6. Conclusions

Newspapers need to assess demand for their product on many levels. Although in the end, the finished product comes out each day looking the same, the sum of the parts of advertising come from markedly different types of consumers. Past research examines help-wanted advertising as a proxy for job vacancies. Most of the research confirms that there is an inverse relationship between unemployment and help-wanted advertising as a proxy for vacancies. As such, the past research is not in reality an examination of the demand of help-wanted advertising, but an examination of job vacancy estimation. As explained in section 2.1, this thesis is only interested in examining demand for help-wanted advertising as a commodity.

Results in both non-lagged and lagged models show that both price and unemployment are inversely related. When POST data is the dependent variable in the lagged equation, all of the coefficients are statistically significant in the one-month and two-month lags. The coefficients increase which may indicate that there is increased sensitivity from employers to the unemployment figures and the price of advertising after a period of time has elapsed. As the coefficient for price becomes proportionally larger in the one-month and the two-month lagged regressions, it also indicates that price becomes more of a factor in determining the demand for help-wanted advertising as time passes, in this case one and two months.

As discussed in 1.2, the internet is becoming a viable substitute for in-paper help-wanted advertising. Future research should find a method to measure internet advertising to use in an expanded model.
References


VITA

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The author was raised in Gloucester City New Jersey where she graduated high school. She received a Bachelor of Arts with high honors from Douglass College, Rutgers the State University of New Jersey in 1985 where she was inducted into Phi Beta Kappa.

Ms. Sherrer has been employed by The Washington Post since 1987. She currently holds the position of Senior Marketing Analyst. She expects to receive her MA in Economics from Virginia Polytechnic Institute and State University in the summer of 2002.