ACADEMY of ECONOMICS and FINANCE

PAPERS AND PROCEEDINGS

38th
ANNUAL MEETING
JACKSONVILLE, FLORIDA
FEBRUARY 9 – 12, 2011

editors

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Academy of **Economics**
and **Finance**

Papers
and
Proceedings

Volume 35, 2011

Thirty-eighth Annual Meeting
Jacksonville, Florida
February 10-13, 2010

Program Arranged by Dr. Steve Jones
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Volume 35	**Papers and Proceedings**	**2011**

Table of Contents

Economics Papers

Finance Papers

The Domestic Balassa-Samuelson Effect of Inflation for the Greek Economy

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Abstract

The goal of this study is to assess whether and to what extent inflation differentials between the tradable and non-tradable sectors in the Greek economy are due to the domestic version of the BS effect and, therefore, the 'expensiveness' of the country and its huge deficit of international competitiveness. Using data over the period 1989 to 2009 from the Greek economy, the empirical results indicate that the domestic Balassa-Samuelson effect is present for the case of Greece and seems to explain about 33% of the overall inflation rate.

Introduction

Retrospection of the empirical literature pinpoints a large interest for the presence of significant inflation differentials in the euro area and the entailing effect on the competitiveness of those countries with higher inflation. It is often argued that one of the main sources of such phenomena is the Balassa-Samuelson (BS) effect, i.e. the difference in productivity growth between tradable and non-tradable sectors within a given country (the domestic version of the BS effect) and compared to abroad (the international version of the BS effect). Focusing on the domestic version of the BS effect, productivity growth in the tradable sector leads to higher wages in that sector and, due to high labor mobility between these sectors, wages in the non-tradable sector also rise. Producers of non-tradable sectors must raise the prices of their products so as to pay higher wages, which, in turn, leads to an increase in the overall price level in the economy.

Inflation remains one of the main problems for the Greek economy. However, a number of researchers have reported that many factors could be ideal candidates for explaining inflation in the economy. McDonald (2005) and National Bank of Greece (2005) show that such potential factors could be wage hikes beyond levels of productivity gains, restrictions on hiring and firing employees that drive up the cost of a firm hiring new workers, the lack of competitive markets and excessive regulation in certain product markets and less to the BS effect.

This study aims at assessing whether and to what extent inflation differentials between the tradable and non-tradable sectors in the Greek economy are due to the domestic version of the BS effect and, therefore, the 'expensiveness' of the country and its huge deficit of international competitiveness. The BS effect is part of the structural inflation phenomenon and of key importance for economic policy. According to Padoa-Schioppa (2003), however, not all inflation is a 'pathological' phenomenon, i.e. faster productivity growth in sectors producing tradable goods and services is part of the 'physiology' of economic growth. The main contribution of this empirical analysis is that it will determine, for the first time, the size of the domestic version of the BS effect as well as the proportion of inflation attributable to it for the case of the Greek economy. Once this effect holds, we can infer that inflation pressures are mainly derived from the sectors of the economy that produce non-tradable goods. Since no price reductions so far appear in that sector, with the exception of telecommunications in which free-market competition prevails, we can easily reach the conclusion that the Greek economy is considered as an expensive economy and, once the arsenal of currency depreciation is empty, somehow the country has to experience a domestic depreciation, an effort heavily pursued by the austerity economic program adopted by the Greek government, the IMF and the European Union authorities 6 months ago to cope with the known Greek drama crisis.

The next section covers the literature relevant to the BS effect, while the following section presents the theoretical background of the BS effect based on which a model is presented. The next section reports the data, the empirical findings for the Greek economy and the discussion surrounding those findings. Finally, concluding remarks and policy implications are presented in the final section.

Literature

The BS effect (Balassa 1964; Samuelson 1964) attempts to explain why in some cases purchasing-power parities calculated as a ratio of consumer goods prices for any pair of countries do not tend to approximate the equilibrium rates of exchange as PPP would predict. It surmises that emerging economies that are usually trying to catch up the developed economies, give more emphasis on the tradable sector; therefore, productivity in the tradable sector usually rises faster than in the non-tradable sector. More specifically, a rise in the productivity of the tradable sector leads to higher wages in both

sectors so that producers in the non-tradable sector can meet higher wages if there is a simultaneous rise in the relative price of goods produced in the non-tradable sector. Nevertheless, the BS effect approach has received some criticism on the grounds that the approach holds under the assumption of perfect labor mobility between the two sectors under investigation. However, differential productivity rates between these two sectors along with the hypothesis of perfect labor mobility is very likely to lead to inflation rates in the tradable sector that are systematically different from those held in the non-tradable sector.

A number of studies have tested the importance of the BS effect in explaining inflation differential for the European economies (De Grauwe and Skudelny (2000) and Canzoneri *et al.* (2002). These studies report evidence in favor of the BS effect. For Greece, Swagel (1999) estimates the international BS effect by using the cointegration approach between relative prices and relative productivities. His results provide evidence in favor of a strong BS effect (1.7 percentage points). Moreover, Gibson and Malley (2008) also attempt to capture the magnitude of the international BS effect for Greece by using sectoral national accounts data, which permits estimation of productivity growth for all sectors involved in the empirical analysis. They state that any particular estimate is contingent on the definition of the tradable sector and the assumption they make about labor shares. The general gist of their paper shows that the international BS effect has been declining through time, probably because the per capita income differential between Greece and the rest of European economies has been diminishing.

Kovács and Simon (1998), Rother (2000), Halpern and Wyplosz (2001), Golinelli and Orsi (2002) show that real appreciation due to productivity differentials is approximately 3 per cent per year in a number of transition economies, whereas De Broeck and Slok (2001), Corricelli and Jazbec (2001) and Égert (2002a and b) find considerably lower estimates of the BS effect, in particular ranging from 0 to 1.5 per cent per year.

Another strand in the literature reports a number of studies for central European economies (Arratibel et al., 2002; Egert, 2003; Egert et al., 2003; Mihaljek and Klau, 2004; Egert, 2005). In the majority of those studies the BS effect does not significantly contribute to the general level of inflation, while other economic and institutional factors seem to do the job. For example, Arratibel et al (2002) conclude that the differential price behavior between the tradable and the non-tradable sectors in the economy is mostly due to fiscal policy and the structure of the economy and not to the BS effect, while Egert (2003) shows that in Estonia the BS effect contributes to inflation from 0.5 to 1 percentage point and other factors, such as international oil prices and inflation inertia, seem to be responsible for inflation phenomena. Mihaljek and Klau (2004) find that the BS effect in central European countries explains only a very small percentage of annual inflation differentials. By contrast, Egert (2005) argues that the BS effect in Croatia seems to play a substantial role in explaining changes in the general price level.

Theoretical background and Modeling the BS Effect

A firm in a competitive environment seeks to maximize its profits and decides to lease a marginal labor unit only if the marginal revenue ($P^* MP_L$) exceeds the marginal cost (W). Thus, the firm's demand for labor is defined by the following equation: $P^* MP_L = W$. Any increase in tradable productivity raises nominal wages, with the price of tradables remaining unchanged due to international competition. Conjecturing perfect labor mobility (i.e., labor is free to migrate between sectors of an economy) between tradable and non-tradable sectors in conjunction with equalized nominal wages in both sectors, brings about the coercion of non-tradable producers to raise the prices of their products to offset the augmented costs. However, the higher implied aggregate price level does not insinuate a loss of competitiveness.

To establish this phenomenon formally, consider the following Cobb-Douglas production functions for the traded and non-traded sectors:

$$Y_t = A_t L_t^{a_t} K_t^{1-a_t} \quad \text{and} \quad Y_n = A_n L_n^{a_n} K_n^{1-a_n} \tag{1}$$

where t and n refer to the traded and non-traded sectors, respectively, Y is output, A is total productivity shifters, L is labor and K is capital, while the parameters a and 1-a pertain to labor's and capital's shares, respectively. Assuming that firms are subject to perfect competition and profit maximization, the level of wages W for both sectors is equal to the marginal revenue product of labor. Hence, W expressed in terms of tradable is given by:

$$W = a_t A_t \left(\frac{K_t}{L_t} \right)^{1-a_t} \quad \text{and} \quad W = \frac{P_n}{P_t} a_n A_n \left(\frac{K_n}{L_n} \right)^{1-a_n} \tag{2}$$

Next, the equality of W across sections is assumed based on the assumption that labor is perfectly mobile. By re-expressing the production functions (1) as capital to labor ratios, we obtain:

$$\frac{K_t}{L_t} = \left(\frac{Y_t}{A_t L_t} \right)^{\frac{1}{1-a_t}} \quad \text{and} \quad \frac{K_n}{L_n} = \left(\frac{Y_n}{A_n L_n} \right)^{\frac{1}{1-a_n}} \tag{3}$$

Substituting these ratios (3) into (2) yields:

$$a_t \left(\frac{Y_t}{L_t} \right) = \frac{P_n}{P_t} a_n \left(\frac{Y_n}{L_n} \right) \tag{4}$$

Log-linearising (4) and solving for sectoral inflation differentials yields:

$\log P_n - \log P_t = \log Y_t - \log L_t - \log Y_n + \log L_n + \log a_t - \log a_n$ (5)

Next, we log-linearise the production functions from (1) we obtain:

$\log Y_t = \log A_t + \alpha_t \log L_t + (1-\alpha_t)\log K_t$ (6)

$\log Y_n = \log A_n + \alpha_n \log L_n + (1-\alpha_n)\log K_n$ (7)

Substituting (6) and (7) into (5) yields:

$\log P_n - \log P_t = \log A_t + \alpha_t \log L_t + (1-\alpha_t)\log K_t - \log L_t - \log A_n - \alpha_n \log L_n - (1-\alpha_n)\log K_n + \log L_n + c$ (8)

where $c = \log a_t - \log a_n$ and which entails:

$\log P_n - \log P_t = \log A_t - \log A_n - \alpha_t(\log K_t - \log L_t) + (\log K_t - \log L_t) + \alpha_n (\log K_n - \log L_n) - (\log K_n - \log L_n) + c$ (9)

where, the Solow residuals for the tradable and the non-tradable sectors are given by:

$\log A_t = \log Y_t - \alpha_t \log L_t - (1-\alpha_t)\log K_t$ (10)

and

$\log A_n = \log Y_n - \alpha_n \log L_n - (1-\alpha_n)\log K_n$ (11)

Next, the interest rate R for both sectors is equal to the marginal revenue product of capital:

$$R = (1-a_t)A_t \left(\frac{K_t}{L_t} \right)^{-a_t} \quad \text{and} \quad R = \frac{P_n}{P_t}(1-a_n)A_n \left(\frac{K_n}{L_n} \right)^{-a_n} \tag{12}$$

Once again, the equality of R across sectors is based on the assumption that capital is perfectly mobile and since the standard small open economy assumption is also employed, R is fixed and equal to the world interest rate. Therefore, the first-order conditions (12) imply that:

$(\log K_t - \log L_t) = \log A_t / \alpha_t$ (13)

and

$(\log K_n - \log L_n) = (\log P_n - \log P_t + \log A_n)/\alpha_n$. (14)

Substituting (13) and (14) into (9), yields the equivalent result of the non-tradable and tradable sectoral inflation differential:

$$\log P_n - \log P_t = \frac{a_n}{a_t} \log A_t - \log A_n + c \tag{15}$$

One can see that the inflation differentials between the two sectors are contingent on the Total Factor Productivity (TFP) growth differentials between them plus the ratio of non-tradables' labor share to tradables' labor share. Provided that the inequality $a_n \geq a_t$ holds, faster productivity growth in tradable than in non-tradable will push the price of non-tradable upward over time. The effect is greater the more labor-intensive are non-tradable sectors relative to tradable sectors.

The estimation of the following equation, coming from equation (15) provides the testable equation for the domestic version of the BS effect:

$\log(P_n/P_{tr})_t = c + b_0 \log(PROD_{tr}/PROD_n)_{t-1} + b_1 \log(P_n/P_{tr})_{t-1} + b_2 DUM2001 + \varepsilon_t$

where, P_n is the non-tradable (service) price index, P_{tr} is the tradable (goods) price index, $PROD_{tr}$ is TFP in the tradable sector, $PROD_n$ is TFP in the non-tradable sector and DUM2001 is a dummy variable for taking into consideration the EMU 2001 effect (the country participation in the eurozone). To allow for the possibility of a delayed pass-through of productivity effects on inflation differentials, productivity terms are lagged up to one year. In addition, the lagged value of the relative price ratio was also included as an additional independent variable first, to avoid any pitfalls in case of the presence of the serial correlation of residuals and second to consider the potential presence of inflation differential persistence.

Data and the Empirical Framework

Data covers the period 1989 to 2009 on a quarterly basis. Data on income, measured as real GDP, labor and the capital stock in both sectors was also obtained. Price indices for both sectors are calculated as value weighted averages of sectoral price indices, where the weights used are the share of each sector's value added in total value added. Data for prices comes

from the Datastream database. Data for GDP was also obtained from the Datastream database, while data for labor was obtained from the National Statistical Service of Greece (ESYE); data for the capital stock comes from the Ministry of Economics. The capital stock series is constructed from sectoral data on gross fixed capital formation assuming perpetual inventories, hence: $K_t = (1-\delta) K_{t-1} + I_t$, where capital stock in each period is measured by the previous-period stock (net of depreciation) augmented with new investment flows. Consistent with previous results, the depreciation rate δ is assigned the value of 10% for the tradable sector and 4% for the non-tradable sector (Sideris and Zonzilos, 2005; Gibson and Malley, 2008), while an initial benchmark is computed as $K_{1989} = I_{1989} / (\delta+i)$, with i being the average logarithmic growth rate of investment in the sample period 1989-2009. Output, labor and capital for both tradable and non-tradable were estimated as a weighted average, where the weights used are the share of each sector's value added in total value added. Another advantage of this paper is that it makes use of the Total Factor Productivity (TFP) measure for constructing the productivity proxies used in the BS equation. The advantage of this approach against the labor productivity approach is that it avoids the exaggeration generated by labor productivity measures.

A major discrepancy concerning the calculation of the domestic BS effect is the definition of the tradable and non-tradable sectors. The BS effect is sensitive to the classification of tradable and non-tradable sectors. The existing literature does not offer a single unified method or criterion for classifying activities in the tradable and non-tradable sectors, although the share of exports in total production in a given activity (often 10% is taken as a borderline value, De Gregorio et al., 1994) is widely accepted. In this paper we consider as tradables the following categories: agriculture (despite being susceptible to subsidies and administered prices-Bragoudakis and Moschos, 2000), mining and quarrying, manufacturing, transport and communications (due to the deregulation and more intense global competition), hotels and restaurants (even though a part of this sector is non-tradable) and financial intermediation and real estate. By contrast, we consider as non-tradable all services, excluding transport and communications, hotels and restaurants, financial intermediation and real estate. Finally, once again, we employ the RATS 6.1 software to serve the goals of our empirical analysis.

To construct the TFP (or PROD) measures we use the Cobb-Douglas production functions as defined in (1):

$$Y_t = A_t L_t^{a_t} K_t^{1-a_t} \quad \text{and} \quad Y_n = A_n L_n^{a_n} K_n^{1-a_n}$$

The residuals proxy TFP measures, i.e. the Solow residuals. Our TFP measure is constructed in the conventional way. It is constructed according to the following formula:

$$(\Delta A_n) = (\Delta y_n) - \alpha (\Delta L_n) - (1-\alpha) (\Delta K_n) \quad \text{and} \quad (\Delta A_t) = (\Delta y_t) - \alpha (\Delta L_t) - (1-\alpha) (\Delta K_t)$$

where A represents the Solow residual (the TFP measure), K is the capital input and L is the labor input (the Δ symbol denotes first-differences). Therefore, our priority is the estimation of the Cobb-Douglas production function for both types of goods in order to get estimates for α and $(1-\alpha)$ shares, e.g. labor and capital shares, respectively.

First, unit root tests are performed to identify the presence or not of any integration process for the series under investigation. We test for unit root nonstationarity by using the tests proposed by Dickey and Fuller (1981). In particular, the analysis is based on the augmented Dickey-Fuller unit root tests. The results are available upon request. Using a 1% significance level, it is clear that the data is consistent with a unit root for all series. When first differences are used, unit root nonstationarity is rejected in all cases. Additionally, Perron (1990) unit root tests with a break were also performed. A break point was considered at 2001, a date which the Greek economy joined the euroland. Once again, using a 1% significance level the results clearly cannot reject the hypothesis of a unit root for all series in levels. When first differences were used, unit root nonstationarity is rejected in all cases.

Next, dynamic OLS estimates (DOLS), suggested by Stock and Watson (1993) are obtained (Table 1). This methodology improves upon Ordinary Least Squares and Maximum Likelihood Estimation methods since it performs well by better allowing the consideration of endogeneity. With DOLS, possible endogeneity problems are accounted for through the inclusion of leads and lags of first differences of the I(1) regressors and the use of the General Least Squares procedure to account for serial correlation in a robust single equation approach. In our case, 2 leads and lags were allowed to be included. The empirical findings denote that the sum of the share parameters is statistically close to one for both the non-tradable and the tradable sectors, implying that the constant returns to scale technology assumption is accepted for both sectors. Moreover, the estimates of the labor share in both sectors are close to those reached by other studies (Gibson and Malley, 2008).

The estimates of the residuals from the production functions yield the values for TFP in both sectors, which in turn are used in the BS estimation regression. After testing for unit roots, all the variables included in the estimated equation, the BS results are reported in Table 2, using again the DOLS methodology. The empirical findings display that the estimated parameter on the productivity growth differential is positive and statistically significant, which plays a key role in the assessment of the domestic version of the BS effect and, thus, provides clear evidence in favor of this effect. In other words, faster productivity growth in tradable vis-à-vis the non-tradable sector, can explain a substantial percentage of the difference in inflation rates between the two sectors under investigation. In particular, a percentage point increase in the productivity differential in the short-run is associated with an increase in the inflation differential of about one third a percentage point (0.358) in the short-run and more than one percentage point (1.320) in the long-run. The contribution of relative TFP

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differentials to relative price differentials can be translated into the contribution to overall inflation (the BS effect) as follows: Considering that the overall inflation is a weighted average of tradable and non-tradable goods inflation:

$$\Delta p = \beta \Delta p_t + (1-\beta) \Delta p_n \tag{16}$$

with β being the share of tradable goods in the overall price index. Next, using (15) we get:

$$\Delta p_n - \Delta p_t = \alpha_n/\alpha_t \, \Delta A_t - \Delta A_n \tag{17}$$

Finally, the overall inflation rate is expressed as:

$$\Delta p = \Delta p_t + (1-\beta) (A_t - A_n) \tag{18}$$

Table 1: Dynamic OLS Estimates for Cobb-Douglas

	Tradable	Non-tradable
constant	0.459	0.516
	(0.356)	(0.369)
α	0.647	0.583
	(0.062)*	(0.071)*
$1-\alpha$	0.314	0.369
	(0.122)*	(0.086)*
R^2	0.68	0.73
H_0: $\alpha + (1-\alpha) = 1$ $x^2(1) =$	0.0845	0.0763
[p-value] =	0.56	0.72

Notes: Figures in parentheses denote robust standard errors (Newey and West, 1987). The number of leads and lags in the DOLS regression is equal to four. * denotes that the coefficient is significant at the 1% critical level.

Table 2: Estimated Coefficients for the Domestic Balassa-Samuelson Effect

Independent variables	*Dependent variable* $\log\left(\dfrac{P_n}{P_t}\right)_t$
C	0.743(3.21)*
$\log\left(\dfrac{PROD_t}{PROD_n}\right)_{t-1}$	Short-run: 0.358 (4.59)* Long-run: 1.320
$\log\left(\dfrac{P_n}{P_t}\right)_{t-1}$	0.728 (4.11)*
DUM2001	-0.362 (-5.44)*
R^2	0.63
LM	1.28 [0.00]
RESET	1.47 [0.00]
BS Effect (Short-run)	**0.451**
BS Effect (Long-run)	**1.682**

Notes: Figures in parentheses denote t-statistics, while those in brackets denote p-values. An asterisk shows significance at 1%. LM is a serial correlation test, while RESET is a model misspecification test. The BS effect was calculated as the contribution of sectoral productivity differential to relative price differential, i.e. the coefficient b_0 adjusted for the share of non-tradable goods. In other words, we get the contribution of relative prices to overall inflation.

In other words, the expression (18) displays the contribution of relative productivity differentials to overall inflation is proportionate to the share of non-tradable goods multiplied by the contribution of relative TFP differentials to relative price differentials, i.e. coefficient b_0, which is the BS effect. Thus, the short-run BS effect turns out to be 0.451 percentage points and the long-run BS effect turns out to be 1.682 percentage points. In other words, in the long-run, faster growth of relative

prices in the non-tradable sector, resulting from faster growth of productivity in tradable relative to non-tradable sectors, contributes around 1.682 percentage points to inflation in Greece, which seems that explains virtually 33% of the overall inflation in Greece in 2010 as Greek closing inflation was 5.2% for 2010. Moreover, the coefficient of the dummy variable is negative, implying that the country participation in the eurozone had a negative effect on the ratio of relative prices, while the coefficient b_1 on lagged relative price changes is large (0.728) and statistically significant, indicating strong persistence of past relative price changes and, thus, high estimates of the long-run effects of differential TFP growth. Finally, certain diagnostic tests, such as serial correlation (LM) and model misspecification (RESET) display the statistical adequacy of the model.

Halpern and Wyplosz (2001) suggest that prices in the non-traded sector are not solely determined by supply factors (as productivity) but also by demand factors. They argue that rising productivity in the traded goods sector not only pushes consumer prices upward, but also increases income, wealth—and thereby consumption. Halpern and Wyplosz (2001) argue that higher income usually induces a higher private demand for services—and hence conclude that the demand side effect would reinforce the Balassa-Samuelson effect. Thus, if private demand is assumed to be biased towards non-traded goods, higher income taxes would crowd out private consumption thus alleviating the upward pressure on inflation. A similar argument can be made with respect to exogenous changes of government demand on non-traded goods prices. As government demand is assumed to be dominated by services, a restrictive fiscal policy could dampen the productivity-driven upward pressure on non-tradable goods prices. Thus, in this section we rerun the BS equation to investigate whether the above results continue to validate the BS effect by incorporating the impact of fiscal policy, as it is proxied by the government deficit (with data obtained from the National Accounts, published by ESYE):

$$\log(P_n/P_{tr})_t = c + b_0 \log(PROD_{tr}/PROD_n)_{t-1} + b_1 \log(P_n/P_{tr})_{t-1} + b_2 DUM2001 + b_3 \Delta DEF_t + \eta_t$$

Halpern and Wyplosz (2001) suggest that prices in the non-traded sector are not solely determined by supply factors (as productivity) but also by demand factors. They argue that rising productivity in the traded goods sector not only pushes consumer prices upward, but also increases income, wealth—and thereby consumption. Halpern and Wyplosz (2001) argue that higher income usually induces a higher private demand for services—and hence conclude that the demand side effect would reinforce the Balassa-Samuelson effect. Thus, if private demand is assumed to be biased towards non-traded goods, higher income taxes would crowd out private consumption thus alleviating the upward pressure on inflation. A similar argument can be made with respect to exogenous changes of government demand on non-traded goods prices. As government demand is assumed to be dominated by services, a restrictive fiscal policy could dampen the productivity-driven upward pressure on non-tradable goods prices. Thus, in this section we rerun the BS equation to investigate whether the above results continue to validate the BS effect by incorporating the impact of fiscal policy, as it is proxied by the government deficit (with data obtained from the National Accounts, published by ESYE):

$$\log(P_n/P_{tr})_t = c + b_0 \log(PROD_{tr}/PROD_n)_{t-1} + b_1 \log(P_n/P_{tr})_{t-1} + b_2 DUM2001 + b_3 \Delta DEF_t + \eta_t$$

where DEF measures tre government deficit and η denotes the error term. The results are reported in Table 3. This time, the long-run BS effect turns out to be 1.572 percentage points. In other words, in the long-run, faster growth of relative prices in the non-tradable sector, resulting from faster growth of productivity in tradable relative to non-tradable sectors, contributes around 1.572 percentage points to inflation in Greece, which seems that explains virtually 30% of the overall inflation in Greece in 2010, which once again denotes the high explanatory power of the BS effect in explaining inflation trends in the Greek economy. The coefficient of the dummy variable continues to be negative, while the coefficient b_1 on lagged relative price changes remains large (0.714) and statistically significant, indicating strong persistence of past relative price changes and, thus, high estimates of the long-run effects of differential TFP growth. Once again, certain diagnostic tests, such as serial correlation (LM) and model misspecification (RESET) display the statistical adequacy of the model.

The empirical results in this chapter reached the conclusion that the magnitude of the domestic Balassa-Samuelson effect is statistically significant. These findings are of considerable interest for domestic policymakers as well as for domestic relevant institutions. In addition, the large size of this effect indicates strong persistence of relative price changes, especially in the sector of tradable goods; the latter fact could be the primary reason for balance of payments disequilibria and, therefore, one of the reasons for the persistent worsening of balance of payments deficits. Productivity measures require relatively declining prices in the tradable sector, which did not really occur given the low competitiveness of the country. This could be due to the fact that productivity gains in the tradable goods sector should be accompanied by rising wages, as sectoral wages should equal sectoral marginal products of labor. Such rising wages seem to be spent on both tradable and non-tradable goods, with the latter not facing any competition from abroad. Although the lower productivity in the services sector, it seems that the increased demand (both from domestic and EU incentives) is not counterbalanced by a rise in quantity or quality of offered services, resulting in higher priced services as well. Rising wages also intensify inflation pressure in the non-tradable sector, deteriorating the international competitiveness of the Greek economy. Finally, for the BS effect to hold there should have been a well-observed increase in exports due to higher domestic productivity, which is not the case due to the high burden of the competitiveness loss and, thus, the country is missing a significant increase in receipt and inflows that would justify a typical BS effect. However, there are important inflows from the EU in the form of structural

funds plus Common Agricultural Policy funds, which in total amount up to 3% of GDP (as in 2009), substituting to an extent for the missing capital inflows.

Table 3: Estimated Coefficients for the Domestic Balassa-Samuelson Effect (With the Fiscal Effect Included)

Independent variables	*Dependent variable* $\log\left(\dfrac{P_n}{P_t}\right)_t$
C	0.651(2.44)**
$\log\left(\dfrac{PROD_t}{PROD_n}\right)_{t-1}$	Short-run: 0.351 (4.15)* Long-run: 1.307
$\log\left(\dfrac{P_n}{P_t}\right)_{t-1}$	0.714 (4.34)*
DUM2001	-0.355 (-5.10)*
ΔDEF	0.124 (3.21)*
R^2	0.67
LM	1.14 [0.00]
RESET	1.38 [0.00]
BS Effect (Short-run)	**0.435**
BS Effect (Long-run)	**1.572**

Notes: Figures in parentheses denote t-statistics, while those in brackets denote p-values. An asterisk shows significance at 1%. LM is a serial correlation test, while RESET is a model misspecification test. The BS effect was calculated as the contribution of sectoral productivity differential to relative price differential, i.e. the coefficient b_0 adjusted for the share of non-tradable goods. In other words, we get the contribution of relative prices to overall inflation.

Concluding Remarks and Policy Implications

In general, the estimations of the BS effect are really important mainly for their policy implications. The main conclusion emerging from the above analysis is that the domestic Balassa-Samuelson effect is present for the case of Greece seems it explains about 30% to 33% of the overall inflation rate. Thus, claims that the BS effect is a significant determinant of inflation in this country seems to strongly hold. What are the policy implications of the above results? If the BS effect is present, as in our case, then productivity differentials between these two sectors in the Greek case seem to have a substantial positive effect on inflation. In such a case, these productivity differentials seem to constitute a barrier to meeting real convergence criteria, without, of course, ignoring other factors, such as fiscal issues and regulated or non-competitive prices that lead to the persistence of price increases in the Greek economy. The persistence issue is rather obvious in the current period as even under the worst recessionary crisis the country undergoes over the last 40 years (-4.5% in 2010), inflation remains at high levels (5.2% in 2010). Finally, the domestic 'expensiveness' problem could be alleviated by implementing structural reforms that are expected to benefit both economic effectiveness and social cohesion.

Acknowledgements

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The Housing Price Bubble in a Suburban Georgia Setting: Using the Hedonic Pricing Model in the New South

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Abstract

This study applies a hedonic pricing model to the rapidly developing suburban housing market adjacent to the Savannah Historic Landmark District in the downtown area of Savannah, Georgia. Using OLS estimation, the hedonic pricing model yields results clearly tracing out the magnitude of the time-related housing price premium in the suburban market analyzed for the years from 2005 to 2010. The results also control for internal and external housing characteristics that are capitalized into the real sales prices of the housing transactions analyzed.

Introduction

The hedonic pricing model has been applied widely in a variety of circumstances to explore housing price behavior in many studies over the years. Excellent overviews of this literature are provided by the comprehensive survey articles by Boyle and Kiel (2001) and Sirmans, Macpherson and Zeitz (2005). Indeed, the hedonic pricing model has been deployed to study wide-ranging factors affecting housing prices such as natural disasters (Murdoch, Singh and Thayer", 1993; Bin and Polasky, 2004; Harrison, Smersh and Schwartz, 2001; Sutter and Poitras, 2010), environmental quality (Graves, Murdock and Thayer, 1988; Garrod and Willis, 1992; Smith and Huang, 1993; Levesque, 1994; Dotzour, 1997; Decker, Nielsen and Sindt, 2005; Netusil, 2005; Neill, Hassenzahl and Assane, 2007; Ramirez, Schaerer, and Philippe, 2008; Steimetz, 2010), safety (Couton, Gardes and Thepauti, 1996), education (McMillen, Seaman and Singell, 2007), and the effects of historic district designation (Coffin, 1989; Ford, 1989; Asabere and Huffman, 1994; Asabere, Huffman and Mehdian, 1994; Clark and Herrin, 1997; Coulson and Leichenko, 2001; Leichenko, Coulson and Listokin, 2001; Cebula, Goldman and Toma, 2008). The recent boom and bust cycle in the nationwide housing market has received treatment by Shimizu and Nishimura (2007), Dorsey, et al. (2010) and Shimizu and Watanabe (2010).

The present study seeks to extend the literature on the housing asset price bubble through application of the hedonic pricing model to house prices in a suburban setting outside of the Historic Landmark District in Savannah, GA. Housing prices in Savannah's historic district have been investigated in nominal terms by U.S. Advisory Panel (1979) and in real terms by Cebula, Goldman and Toma (2008). In many respects, this study is complementary to that of Cebula, Goldman and Toma (2008) by considering residential real estate development in a suburban setting that is more likely to have been affected by the housing bubble than the downtown housing market in the historic district. The geography of Savannah and the path of development in the area support this hypothesis. The downtown historic district is bounded on the north by the Savannah River and the marshlands of South Carolina; bordered to the east by well-developed land scattered across barrier islands leading to the Atlantic Ocean; and bordered to the direct south by suburban development that dates from the 1960s to 1980s. Recent new residential construction in these areas is primarily small in scale and of the in-fill variety.

However, to the southwest and west of Savannah in Chatham County along the Interstate 95 corridor, new housing permits have been authorized for up to 40,000 mostly middle class housing units (Savannah Morning News, 2005) for expected development during the next twenty years. This area has experienced substantial development of new, large-scale neighborhoods leading up the housing market crash in 2007. The new developments, and by proximity, existing development in the western suburbs of Savannah are more likely to have been affected by the over-development of residential housing construction that swept the nation. Indeed, the cross-tabulation of average and median home sales prices, mean days on market, and number of transactions by year in Table 1 bears this out. In 2006, 970 homes sold in this portion of the county at a median sale price of $186,663, while by December 2010, sales volume decreased to less than 500 homes at a median sale price of $158,995. The mean number of days on market before a sale was just under three months in 2006 and over five months by 2010. It is clear from these descriptive statistics that the study area southwest and west of Savannah was affected substantially by the housing market boom and bust cycle.

Table 1. Cross Year Comparisons

Year	Sold Homes	Mean Sales Price	Median Sales Price	Days on Market
2006	970	198,855	186,663	84.59
2007	794	192,901	182,210	108.34
2008	694	177,432	171,174	141.44
2009	723	174,047	167,322	151.19
2010*	498	168,616	158,995	162.34

*Data through November 2010. Data expressed in 2010 constant dollars, where applicable.

While much of the hedonic housing price literature focuses on the overall market, more recent studies have considered sub-components of the market by price (Bourassa, Hoesli, and Peng, 2003; Ho, Ma, and Haurin, 2008; Farmer and Lipscomb, 2010). These authors observe significant sub-market differentials in housing price sensitivity to housing attributes. The present study notes these results and therefore focuses on middle class housing to evaluate whether a time varying housing price premium is present in the market studied.

The transaction price of the homes studied was between $75,000 and $300,000 in nominal terms. As suggested above, the wave of recent development in the Savannah area has been to the west and southwest of the downtown and islands areas that are characterized by a greater density of premium residential housing. For example, the mean real transaction price for a single family home in the downtown historic landmark district in 2010 was $359,146 while on Tybee Island, a coastal resort barrier island, the mean 2010 sale price was $319,335. By comparison, only 59 of 658 (9%) house sales west of Savannah had a transaction price that exceeded $320,000 in 2010. The density of typical middle class housing in our data set facilitates the focus of the present study on the housing bubble's effects on recently developed and developing middle class residential housing prices.

The unique aspect of the present study is that the magnitude of the time-varying housing price premium is identified in a suburban market characterized by very recent development leading up to the nationwide bust in real estate. Similar to Cebula, Goldman and Toma (2008), this analysis includes variables that characterize the seasonal variation of real sale prices of homes in a suburban setting. This allows the estimation of a recurring pattern in quarterly data in the presence of an underlying trend driving home sale prices. However, one additional interesting facet of this analysis is that the period of study (2005 to 2010) immediately follows that considered by Cebula, Goldman and Toma (2008) in their investigation of historic landmark housing prices from 2000 through 2005. Thus, their research may include some effects of the housing price bubble in historic district properties, but they do not expressly control for the annual fixed effects attributable to a broadly evolving time trend.

The next section provides a description of the data set analyzed and the hedonic pricing model. As is common in the literature, the model is estimated in linear and semi-log form. The subsequent section provides the results of several specifications of the model and an interpretation of the results. The last section is a conclusion summarizing the results.

The Framework for the Empirical Analysis

Sirmans, Macpherson and Zeitz (2005) provide a thorough overview of the underlying theory and summary of numerous empirical applications of the hedonic pricing model, and thus, the theoretical foundation receives little more than summary treatment herein. The straightforward premise is that a house characterizes a package or bundle of desirable and undesirable factors for utility-maximizing consumers to evaluate. The valuation of these features are capitalized into the transaction price of the house. The hedonic pricing model parses the transaction price into attributes such as interior and exterior features, locational factors, idiosyncratic characteristics associated with the house, and seasonal and annual fixed-effects. The model's estimated parameters provide information about the significance and magnitude of the effect of any given, observable, attribute of the house.

The hedonic pricing model applied in the present study takes the following form:

$PRICE_j = f(I_j, E_j, O_j)$

and

$LnPRICE_j = f(I_j, E_j, O_j)$

where:

$PRICE_j$ = the *real* price of house j, where the price of the jth house is expressed in 2010 dollars;

and

$LnPRICE_j$ = the natural log of the *real* price of house j, where the price of the jth house is expressed in 2010 dollars;

I_j = a vector of interior physical characteristics for house j;

E_j = a vector of external physical characteristics for house j; and

O_j = a vector of other factors associated with house j.

This model is estimated using a five-year period of data from November 2005 to November 2010 to assess the relative importance of housing characteristics and time-related effects on real home sales prices in a suburban setting characterized by recent residential development. Data were obtained from the Savannah Board of Realtors' Multiple Listing Service. Since middle class housing was the focus of this study, observations were limited to homes that sold for between $75,000 and $300,000, which resulted in 3,852 sold homes. As this area of Chatham County has been the source of virtually all of the area's growth, a sizable portion, 63%, of the sold homes were new construction. Nominal housing prices were converted into real values using the quarterly CPI obtained through the BLS website (www.BLS.gov). The average house in the sample was a single family dwelling (i.e. not a townhouse/condominium) located in the 31419 zip code, was 1,751 square feet, had two bathrooms, a fireplace, a two car garage, a laundry room, was associated with a covenant, and sold for $184,553 in the third quarter of 2006.

There were a variety of interior and exterior physical characteristics available for each house sold, as well as other factors that were included in the analysis. These factors are listed and formally defined in Table 2. The key descriptive statistics for each of the variables considered in the analysis are available upon request. Naturally, for each of the impacts of the explanatory variables on housing price in the model, the expected sign is proffered under the assumption of *ceteris paribus*.

Table 2. Variables in the Model

PRICE= the price of house j expressed in 2010 dollars
LnPRICE= the natural log of the price of house j expressed in 2010 dollars
SQFT= the total number of square feet of finished living space in house j
BATHS= the total number of full bathrooms in house j
GARAGE= the number of garages spaces on house j's premises
AGE= the age of house j
LAUNDRY= a binary variable = 1 when house had a laundry room and =0 otherwise
HARDWOOD= a binary variable = 1 when house had hardwood floors and =0 otherwise
CEILING9 = a binary variable = 1 when house had 9 foot (or higher) ceilings and =0 otherwise
COV= a binary variable= 1 when house was associated with a covenant and =0 otherwise
ELEC= a binary variable = 1 when house was all electric and =0 otherwise
FIREPLACE= the number of fireplaces in house j
FORCLOSE= a binary variable = 1 when house was a foreclosure and =0 otherwise
WATERFRNT= a binary variable = 1 when house was waterfront and =0 otherwise
NEW= a binary variable =1 when house was new at the time of sale and = 0 otherwise
SPRINKLER=a binary variable=1 when house had underground sprinkler system= 0 otherwise
TOWNHOUSE= a binary variable=1 when house was a townhouse or condo and = 0 otherwise
Q1= a binary variable=1 when house was sold in first quarter (Jan-March)
Q2= a binary variable=1 when house was sold in second quarter (April-June)
Q3= a binary variable=1 when house was sold in third quarter (July-Sept)
Q4= a binary variable=1 when house was sold in fourth quarter (Oct-Dec)
Y2005= a binary variable =1 when house was sold in year 2005
Y2006= a binary variable =1 when house was sold in year 2006
Y2007= a binary variable =1 when house was sold in year 2007
Y2008= a binary variable =1 when house was sold in year 2008
Y2009= a binary variable =1 when house was sold in year 2009
Y2010= a binary variable =1 when house was sold in year 2010
Z31302= a binary variable =1 when house was sold in zip code 31302
Z31322= a binary variable =1 when house was sold in zip code 31322
Z31405= a binary variable =1 when house was sold in zip code 31405
Z31407= a binary variable =1 when house was sold in zip code 31407
Z31406= a binary variable =1 when house was sold in zip code 31406
Z31419= a binary variable =1 when house was sold in zip code 31419

The interior physical characteristics of house j include: SQFT, the number of square feet of finished interior living space; BATHS, the total number of full baths; AGE, the age of the house in years; LAUNDRY, the presence of a laundry room; HARDWOOD, the presence of hardwood floors; CEILING9, the presents of nine foot (or higher) ceilings, ELEC, indicating that the house was all electric; and FIREPLACES, the total number of fireplaces. The number of bedrooms was omitted because it was very highly correlated with the variables SQFT and BATHS. Additionally, there was very little variation in the number of bedrooms in the sample. The mean number of bedrooms was approximately 3.22, with a standard deviation of 0.63.

As observed in Sirmans, Macpherson and Zeitz (2005), and based on a variety of other studies, including Ford (1989), Clark and Herrin (1997), Coulson and Leichenko (2001), Leichenko, Coulson and Listokin (2001), Laurice and Bhattacharya (2005), and Decker, Nielsen and Sindt (2005), the real sales price (PRICE and LnPRICE) of house j is expected to be an increasing function of the number of desirable internal physical housing characteristics. For example, LnPRICE is expected to be an increasing function of the number of bathrooms, fireplaces, and square footage of finished living space. It also is expected to be an increasing function of the presence of a laundry room, hardwood floors, and nine foot ceilings. In addition, since older homes may have a higher likelihood of needing repair and may more imperfectly reflect modern preferences, LnPRICE is expected to be a decreasing function of the age of the house.

The exterior physical characteristics of house j include: GARAGE, the number of garage car spaces that are part of the house; WATERFRNT, whether the house is on a water front lot; SPRINKLER, whether the house has an underground sprinkler system; and TOWNHOUSE, whether the house was a townhouse versus a single family dwelling.

Since water front property is usually desirable, LnPRICE of house j is expected to be an increasing function of WATERFRNT. As observed by Laurice and Bhattacharya (2005), the number of garage spaces (Leichenko, Coulson and Listokin, 2001; Laurice and Bhattacharya, 2005) is likewise expected to be positively related to the selling price. The presence of an underground sprinkler system is predicted to increase the sales price (Sirmans, Macpherson and Zeitz, 2005). As a private back yard may be desirable, TOWNHOUSE is expected to be negatively related to sales price.

Several other idiosyncratic factors associated with house j include: NEW, whether the house was new at the time of sale, and COV, whether the house was associated with a home owners association covenant. As suggested in Sirmans, Macpherson and Zeitz (2005), Clark and Herrin (1997), Decker, Nielsen and Sindt (2005), Ford (1989), and Laurice and Bhattacharya (2005), the age of a house is expected to adversely influence its sales price. Accordingly, it is argued here that a "new" house will tend to command a greater market price. The variable FORCLOSE indicates the house to have been a foreclosed property and is likely to be associated with a lower selling price.

Seasonal controls by quarter, Q1 (January through March), Q2 (April through June), Q3 (July through September), and Q4 (October through December) are included to control for any seasonal effects, but no expectations about sign are overly obvious. Likewise, locational controls are present in the form of zip code fixed effects (Z31302, Z31322, Z31405, Z31407, Z31408, Z31406, Z31419), but, again, no *a priori* expectations are immediately clear.

Most importantly for this study, yearly fixed effects, Y2005 through Y2009 (with year 2010 as the omitted category) are included. The coefficients on these variables will be used to evaluate whether an asset price bubble was present, and if so, to measure the magnitude of the housing bubble in suburban Chatham County.

Empirical Results

This section presents the results of the estimated hedonic model described in the previous section. Two similar specifications were used, differing only in their respective dependent variables. In the first, PRICE was used and in the second, a semi-log specification was employed and thus the dependent variable was LnPRICE. In each of the estimates, the White (1980) procedure is adopted to correct for heteroskedasticity. Estimates are provided in Table 3.

All of the estimated coefficients exhibit the expected signs (where an expectation was present) with most reaching high levels of statistical significance. In the semi-log specification, twenty-two of the twenty-nine independent variables were statistically significant at the 1% level, with two additional variables reaching statistical significance at the 10% level of significance. Excluding the locational zip code controls, only two variables fail to reach statistically significance at any conventional level. The coefficient of determination indicates that for each specification, nearly 80% of the variation in the dependent variables (PRICE and LnPRICE) was explained by the model. Finally, the F-statistic is significant at far beyond the one percent level in both cases, yielding evidence regarding the overall strength of the models.

Based on estimates in Table 3, the real sales price of houses in suburban Savannah is a positive function of size (SQFT), number of bathrooms, garage spaces, and fireplaces. In addition, the presence of a laundry room, nine foot ceilings, hardwood floors, an underground sprinkler system, being associated with a covenant, and being water front add to the sales price. Undesirable house features that reduce the natural log of the real sales price are the house being all electric, being a townhouse, being a foreclosed property, and being an older home.

Table 3. OLS Estimates of the Hedonic Pricing Model

Variable	Dep Var: PRICE		Dep Var: LnPRICE	
	Coefficient	T-Statistic	Coefficient	T-Statistic
Constant	18,592.76		11.219	
SQFT	53.30***	(46.37)	0.0003***	(48.22)
BATHS	6,416.15***	(4.73)	0.033***	(5.00)
GARAGE	9,194.51***	(9.69)	0.065***	(12.62)
AGE	-511.87***	(-6.85)	-0.004***	(-7.68)
LAUNDRY	5,330.90***	(6.36)	0.029***	(6.38)
HARDWOOD	16,563.47***	(16.09)	0.075***	(14.8)
CEILING9	8,738.80***	(8.96)	0.045***	(9.26)
COV	8,703.15***	(5.71)	0.054***	(6.52)
ELEC	-4,836.19**	(-2.26)	-0.035***	(-2.95)
FIREPLACE	11,174.14***	(12.71)	0.060***	(12.86)
FORCLOSE	-15,805.51**	(-2.11)	-0.093*	(-1.92)
WATERFRNT	3,238.30**	(2.16)	0.019***	(2.52)
NEW	655.54	(0.56)	0.005	(0.75)
SPRINKLER	10,053.37***	(9.44)	0.051***	(9.68)
TOWNHOUSE	-7,101.92***	(-4.06)	-0.049***	(-5.20)
Q1	5,224.16***	(4.53)	0.029***	(4.86)
Q2	4,753.87***	(4.45)	0.024***	(4.38)
Q3	1,081.63	(1.01)	0.005	(0.85)
Y2005	37,217.65***	(17.04)	0.211***	(18.39)
Y2006	41,593.93***	(29.37)	0.230***	(30.38)
Y2007	37,105.19***	(26.38)	0.207***	(26.83)
Y2008	19,397.26***	(14.71)	0.117***	(15.48)
Y2009	10,510.86***	(7.64)	0.061***	(8.02)
Z31302	1,977.78	(0.27)	0.006	(0.17)
Z31322	-2,262.02**	(-2.45)	-0.021***	(-4.44)
Z31405	5,513.78***	(2.72)	0.008	(0.81)
Z31407	-16,566.08***	(-11.43)	-0.119***	(-15.75)
Z31408	1,367.86	(0.28)	0.016	(0.59)
Z31406	2,671.73	(1.29)	0.021*	(1.83)
Adjusted R^2	0.775		0.791	
F	452.15		510.24	

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level
The omitted binary variables are Q4, Y2010, and Z31419.

Note that while the signs were as expected on these interior characteristics, a few of the coefficients were larger in magnitude that what might be expected. For example, the semi-log model predicts that a house having hardwood floors would be associated with nearly an eight percent premium. Evaluated at the mean, this implies a nearly $13,000 increase in value. The other specification of the model, with PRICE as the dependent variable, suggests the premium is even larger: $16,563. One explanation of this high premium could be that this characteristic is correlated with other desirable amenities that are not included in the model. For example, homes with hardwood floors may be more likely to have other upgrades, such as granite countertops or more expensive fixtures, and if these characteristics are omitted from the model, the correlated variable will be biased upward.

Additionally, some seasonality can be observed. Homes sold in the first or second quarter of a given year sell for a 2.9% and 2.4% premium respectively over those sold in the fourth quarter. Those sold in the third quarter sold, on average, for slightly more (one half of one percent) than those in the fourth quarter, but the difference was statistically indistinguishable from zero.

The rise and fall of the housing boom can be readily seen in these results. Peaking in 2006, where home prices saw a 23% premium relative to their eventual level in 2010, home values experienced a steady decline, falling slowly at first by a little over two percentage points in 2007, then declining nine percentage points in 2008, followed by yet another 5 percentage point decrease in 2009. All of these yearly fixed effects were highly statistically significant across both specifications. Based on the above findings, a closer look was taken at the trend with an alternative model specification. All of the structural and locational controls remained as before but in place of the seasonal and yearly controls (Q1-Q3 and Y2005-Y2009), quarterly fixed effects were included (Q1_2005 through Q2_2010). The third quarter of 2010 was used as the reference group as it was the final quarter for which complete data were available. Table 4 presents the results of this specification for the quarterly fixed effects (other results are present but suppressed) which more clearly highlights the ups and downs of suburban housing prices in this period. The buildup can be seen in late 2005 to the peak in 2006, after which, a relatively steady decline is apparent.

Table 4. OLS Estimates of the Quarterly Fixed Effects of the Hedonic Pricing Model

Dep Var: LnPRICE

| Variable	Coefficient	T-Statistic	Variable	Coefficient	T-Statistic
Q4_2005	0.216***	(16.26)	Q1_2008	0.155***	(11.53)
Q1_2006	0.243***	(19.01)	Q2_2008	0.142***	(11.30)
Q2_2006	0.251***	(20.22)	Q3_2008	0.125***	(9.72)
Q3_2006	0.246***	(19.83)	Q4_2008	0.125***	(9.43)
Q4_2006	0.260***	(20.32)	Q1_2009	0.108***	(8.01)
Q1_2007	0.249***	(18.20)	Q2_2009	0.098***	(7.74)
Q2_2007	0.243***	(18.20)	Q3_2009	0.067***	(4.71)
Q3_2007	0.224***	(17.77)	Q4_2009	0.058***	(4.24)
Q4_2007	0.187***	(13.55)	Q1_2010	0.043***	(2.69)
			Q2_2010	0.034**	(2.39)

Adjusted R^2 = 0.793, F = 375.13

*** significant at the 1% level, ** significant at the 5% level, significant at the 10% level

Note: The omitted variable is Q3_2010. All non-time related controls are present but suppressed.

Conclusion

This study applies the hedonic pricing model to middle class houses sold in a suburban area of Savannah characterized by substantial development since 2000. The study focuses on middle class houses sold within this area for the five-year period from November 2005 through November 2010. House prices are expressed in 2010 dollars. The basic model structure is that 15 internal and external housing attributes could potentially affect real housing prices. Furthermore, the models include seven general geographic controls based on zip codes, and quarterly variables characterizing the three-month period of the year in which the transaction took place to identify and control for the peak selling season in this portion of Chatham County.

The findings of this study are that the level and natural log of real sales price of a middle class house in suburban Savannah during the 2005-2010 period was positive function of size (SQFT), number of bathrooms, garage spaces, and fireplaces. In addition, the presence of a laundry room, nine foot ceilings, hardwood floors, an underground sprinkler system, being associated with a covenant, and being water front add to the sales price. Undesirable house features that reduce the natural log of the real sales price include being all electric, a townhouse, foreclosure, and age of the house. Sale of the house during the first two quarters of the year raises the real sales price.

As indicated above, the primary focus of this study was an investigation of the time-varying housing price premium over the boom and bust housing market cycle. These fixed-effects are estimated in annual and quarterly terms. Based on annual data, the housing market in the study area peaked in 2006 with prices at a 23% premium as compared to 2010. The quarterly data allows the identification of the peak in the fourth quarter of 2006, when the time-dependent housing price premium reached 26% as compared to the third quarter of 2010. Figure 1 below plots the estimated quarterly fixed effects and clearly identifies the peak of the housing market and the subsequent deflation of the housing asset bubble in the middle class suburbia of Savannah, GA.

Figure 1. Estimated Quarterly Fixed Effect on Housing Prices
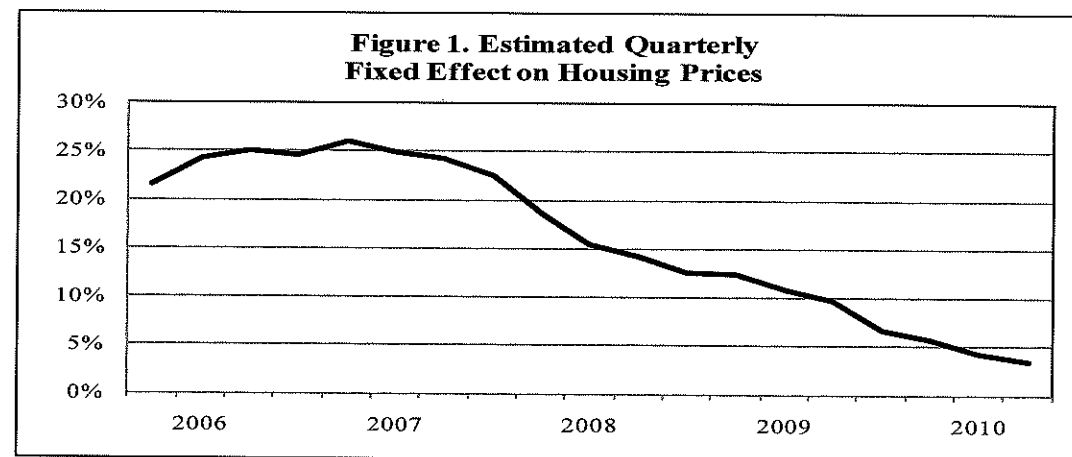
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You're Hired! When To Hire A College Football Coach?

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Abstract

Decision to hire a college football coach may seem trivial to outsiders. However, success of a college football program can positively impact local economy, student enrollment, state appropriation money, and others. Although a good college football coach is usually the highest paid employee at a school, he can generate enough revenues to justify the costs. Therefore, replacing a mediocre football coach with a good one is important for school administrators. Using a manually collected dataset of college football coach turnover from 1980 to 2009, we study the determinants of college football coach hiring processes.

Introduction

College football has become one of the most popular and profitable sports in the United States. It is an unsurprising fact because of the popularity of football and that Americans are generally still very loyal to the teams of their alma maters even long after they finish college. They still follow their alma mater teams closely and are willing to travel and spend money when their teams play on the road. Successful football programs benefit the school directly and indirectly. The direct financial benefits come from ticket sales, concession and parking revenues, TV and radio revenues, revenues from playing post-season games (bowl games), sale of licensed merchandise, and the profit sharing from the conference that the school plays in. The indirect financial benefit for the school could come from increased giving and donations from alumni as the school wins more games.

Surprisingly, studies show that when a school has successful football program, it attracts more and better qualified undergraduate applicants (see Murphy and Trandel (1994), Tucker and Amato (1993), and Tucker (2005)). This is reasonable because a school with successful football program is more recognized nationally and could attract better applicants not only from the state where the school is located, but also from neighbor states and other states, which results in higher competition for a student to get accepted. Another interesting fact is evidence showing that institutions with successful football programs receive between 3% and 8% increases in state appropriations the following year and also finds that schools with Division 1-A football programs receive approximately 6% more than schools without Division 1-A football programs (see Humphreys (2006)).

Considering the significance of having a successful college football program, it is very clear that the decision to hire a college football coach is very important for many parties like the school's board of trustees, school administrators, important donors and boosters, fans, and local business owners. The decision to hire a college football coach is usually made collectively by the school's board of trustees, school administrator, and important boosters. The decision making process is usually done behind the closed door and outsiders do not really know how the decision process goes. We do not know much about what makes a successful or failed hiring. Therefore, in this paper we examine factors that could potentially influence the success of a new college football coach.

Using a hand-collected dataset of college football coach from 1980 to 2009, we address different intriguing questions around the hiring of a new coach. The questions about the hiring of a new coach include how do schools select a new football coach, what characteristics of a coach will determine his future success, how long should the school wait before their new coach start showing some improvement, will schools make a bad rushed decision by replacing a good coach with a worse candidate, does having experience as a head football coach matter for a new candidate to succeed, and how young (old) should an ideal coach be.

Data

The data covers over thirty years of college football coach turnovers from NCAA Division 1 (currently known as Division 1 Football Bowl Subdivision or FBS) schools from 1980 through 2009. There are 631 coach turnovers during that time period and we only include coaches who coach at least half of a season at a school (i.e., we exclude all interim coaches). Data is collected from various sources including the ESPN.com website, College Football Data Warehouse.com, and websites of the respective coaches' schools. If data is missing, we individually gather the data through various public online sources to ensure the consistency and accuracy of the data.

The variables collected include length of coach's prior experience as a college football head coach, the insider/outsider dummy variable, coach's coaching philosophy (offense or defense), NFL background (whether or not they have had any NFL coaching experience), age when hired, and win/loss record while coaching at the school.

We collect each school's win/loss record from 1980 to 2009 to determine the average coaches' performance for their first five years, and the year before the new coach was hired. We also collect win/loss records of the new coaches at the schools they previously coached. We present the data descriptive statistics in table one.

Table 1: Descriptive Statistics

	Mean	SD	Min	Max
Years of Head Coach Experience	3.910	5.449	0	28
Insider	0.270	0.444	0	1
Prior NFL Experience	0.220	0.415	0	1
Offense	0.614	0.487	0	1
Age When Hired	45.002	6.930	30	68
Cumulative Win/Loss Record	0.471	0.182	0.000	0.925
Years Coaching at School	5.910	4.619	1	44
Predecessor's Performance In Final Year	0.433	0.231	0.000	1.000
First Year Coach Performance	0.425	0.227	0.000	1.000
Second Year Coach Performance	0.469	0.236	0.000	1.000
Third Year Coach Performance	0.491	0.233	0.000	1.000
Fourth Year Coach Performance	0.517	0.219	0.000	1.000
Fifth Year Coach Performance	0.531	0.227	0.000	1.000
Coach Performance Three Years Prior To Being Hired	0.587	0.218	0.000	1.000
Coach Performance Two Years Prior To Being Hired	0.599	0.216	0.000	1.000
Coach Performance One Year Prior To Being Hired	0.608	0.208	0.000	1.000

There are some interesting observations from table 1. Schools seem to look for relatively younger coaches (76.54% of new coaches are in their 30s and 40s). This indicates that schools do not desperately look for the quick fix for their football program (by hiring older and more proven coaches) but they would rather potential long-term stability for their football program at the risk of hiring relatively unproven younger coaches. However, schools attempt to mitigate this risk by hiring younger coaches with good potential (new coaches usually perform better over the years leading to their appointment as new head coach at another school). This also indicates that schools might be hesitant on spending too much money to pay their coach as the college football coach compensation debate has been quite hot and controversial and this is more severe with public universities.

We also observe that schools prefer coaches with offensive coaching philosophy. A legendary college football coach at the University of Alabama, Paul "Bear" Bryant said "Offense sells tickets and defense wins championships." Like any other business entities, schools want to generate more revenues than the costs of paying the football coaching staff and they try to accomplish this by trying to hire a new coach who can bring excitement and hope to their football program through their offensive coaching philosophy. It is also apparent that schools try to bring excitement to their football program by bringing in "new blood" as their new coach. They bring in the new coach from the outside rather than to promote someone who is already in the current coaching staff. This phenomenon is consistent with what we see from the business world where there is an increasing number of outsider CEO appointments.

Having some NFL coaching experience does not really matter when it comes to the decision to hire a college football coach. This is because the nature of college football is very different from the professional football. Using a regression model, we will re-examine the observations that we see from table one.

Model

We examine the win/loss record improvements from a year before the hire to the first year after they coach at a new school, from previous year to year 2, from previous year to year 3, from previous year to year 4, from previous year to year 5, and from year 1 to year 5 to find the average years needed for a coach to start showing some results.

To determine how coach characteristic variables (like experience, insider/outsider dummy, NFL background, coaching philosophy, and age) impact his future college career success (measured by the win/loss record at the new school in subsequent years), we run the OLS regression where the dependent variable is the win loss record at the new school and the independent variables are the coach characteristic variables. X1 represents number of years being a head coach at another school, X2 is insider/outsider dummy, X3 is NFL background dummy, X4 is the coaching philosophy dummy, and X5 is age when the coach is hired.

$$\text{W/L Record}_{i,t} = \beta_0 + \beta_1 X1_{i,t} + \beta_2 X2_{i,t} + \beta_3 X3_{i,t} + \beta_4 X4_{i,t} + \beta_5 X5_{i,t} + \varepsilon_{i,t} \tag{1}$$

For robustness check, we use five measures of W/L record: the W/L record one year, two years, three years, four years, and five years after the hire.

Results

We present the improvement in school's win/loss record after they hired a new coach in table 2. In general, it is unrealistic to expect that new coaches will turn around a struggling program right away after they got hired. This is because no matter how good a coach is, he will need some time to recruit the players that will fit in his system and for the coach himself to adjust to the new culture at new school. When a new coach arrives, he only has players that were recruited by the old coach and those players might not be the type of players that will do well under the new coach's system. A famous example is Coach Rich Rodriguez who was a very successful coach at West Virginia University and got hired by the University of Michigan. One reason that fans and administrators gave him the benefit of the doubt when he did not perform as well as he had done at previous school was that he needed more time to succeed.

From table 2, we find that the win/loss record of a program, on average, gets worse from a year before to the first year after the new coach is hired. This means that the first year after the new coach is hired is usually the most challenging time period for the new coach. Fortunately, this adjustment period does not last very long and that new coaches usually start showing some improvement in year 2 and this continues to year 6 and then it starts declining after year 7. This suggests that schools should wait a little bit longer before they make rushed decision to replace the new coach with someone else and on average, a coach will show the biggest improvement after 6 years staying at one school.

Table 2: The average school performance improvements under new coaches

From one year before to one year after the hire	-0.76%
From one year before to two years after the hire	3.42%
From one year before to three years after the hire	5.79%
From one year before to four years after the hire	8.32%
From one year before to five years after the hire	9.77%
From one year before to six years after the hire	14.26%
From one year before to seven years after the hire	12.13%
From one year before to eight years after the hire	12.05%

For the regression analysis, I run two analyses: that with the full sample and that with the schools that have won the national championship(s) in the past. Schools that have won national championship(s) in the past arguably have higher expectation and richer tradition. Therefore, they may have different criteria to hire a new coach and give the new coaches shorter leashes. We present the results in table 3 (full sample) and table 4 ("elite" schools).

Table 3: Regression Results from All Schools in the Sample

	Model 1	Model 2	Model 3	Model 4	Model 5
age	0.000	-0.001	0.000	0.001	-0.004
	(0.938)	(0.719)	(0.966)	(0.697)	(0.209)
nfldum	-0.018	-0.047	0.003	-0.051	-0.054
	(0.506)	(0.122)	(0.936)	(0.122)	(0.144)
offdum	0.020	-0.027	-0.049	-0.056	-0.039
	(0.434)	(0.335)	(0.101)	**-(0.061)**	(0.230)
insoutdum	0.167	0.114	0.111	0.090	0.082
	(0.000)	**(0.000)**	**(0.000)**	**(0.004)**	**(0.019)**
yearshc	0.005	0.008	0.006	0.004	0.009
	(0.096)	**(0.009)**	**(0.055)**	(0.227)	**(0.020)**
_cons	0.355	0.487	0.483	0.495	0.707
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: p-values are given in parenthesis and bold values

Table 3 shows that in general, age of a new head coach when hired is insignificant to future college coaching career success. The signs of the coefficients are also mixed, which require more explanation. We find that having some NFL coaching experience (either as an NFL head coach or as an NFL assistant coach) does not help the new head coach in their college coaching career. The coefficients are insignificantly negative (except for model 3, in which the dependent variable is the win/loss record 3 years after the hiring). This means that having NFL coaching experience is associated with worse win/loss record at the college level. This is probably because it takes a different set of skills for a head coach to succeed at the college level. At the college level, they need to able to guide young students (coaches need to be the father figure to their athletes) and provide them with some structures and discipline, while at the professional level they cannot really discipline professional athletes and they need to be more of the athlete's partner.

We also find that a coach's coaching philosophy is insignificant in explaining the future success. However, we find that the coefficients are generally negative, which means that offensive minded coaches (denoted by offdum variable equals 1) are associated with worse win/loss record. This is very interesting because in table 1, we find that 61.40% of the new hires are offensive minded coaches. This supports the notion that schools try to sell more seats and bring more excitement to their program by bringing in coaches who can provide the fans/students with high scoring games. However, this strategy of selling more seats is not always optimal for schools that are serious in pursuing a championship (this might be a good strategy for low level schools who struggle to fill in their stadiums).

A very interesting result is that we find significantly positive coefficients for the insider/outsider dummy (1 means that the new head coach comes from inside the program and 0 otherwise). New head coaches who are promoted from within the program are associated with better win/loss records. There might be another benefit for hiring an insider, which is the fact that new coaches who are promoted from within the program are usually paid less. We find similarly strong support for all models. We also find that experience level of the new head coach matters. The longer a coach has been a head coach at the college level, the better the win/loss record he will have in the future.

Conclusion

We examine factors that could influence a college football coach's future success and find that the two most important factors are being an insider coach and the number of years being a college head coach. These results are independent of the type of schools used in the regression (either the full sample or the sample of the "elite" schools). The results suggest that a school will be financially better off hiring an insider who is already familiar with the program (avoiding the dreaded transition period) or an outsider with some experience of being a head coach at another school. It is also important for a school not to fire the current struggling coach without giving him enough time to succeed (on average, it takes about 6 years before a coach shows the biggest improvement).

There are questions left unanswered such as what is the optimal coach compensation and how should it be paid. Due to the data limitation, we are currently unable to answer those very important questions and they will remain interesting research questions to be addressed in the future.

Table 4: Regression Results from Schools with National Championship(s)

	Model 1	Model 2	Model 3	Model 4	Model 5
age	-0.004	-0.007	-0.004	-0.007	-0.010
	(0.324)	(0.108)	(0.338)	**(0.092)**	**(0.021)**
nfldum	0.003	-0.042	-0.025	-0.049	0.062
	(0.952)	(0.395)	(0.619)	(0.297)	(0.203)
offdum	-0.002	0.023	-0.017	0.017	0.014
	(0.962)	(0.620)	(0.731)	(0.697)	(0.746)
insoutdum	0.160	0.093	0.056	0.082	0.057
	(0.001)	**(0.070)**	(0.274)	**(0.082)**	(0.219)
yearshc	0.007	0.008	0.006	0.008	0.011
	(0.097)	**(0.100)**	(0.224)	**(0.081)**	**(0.011)**
_cons	0.597	0.861	0.794	0.877	1.029
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: p-values are given in parenthesis and bold values

We find similar results for the sample of schools with rich traditions in football. However, there is an additional finding from this sample. We find that age when the head coach is hired matters and it is significantly negative (which means that the younger the coaches when they get hired, the better the win/loss records will be).

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Wage-Employment-Driven Business Cycle Model

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Abstract

This paper presents a wage-employment-driven, endogenous, no-trend, business cycle dynamic model (BuCDyn). The math model is developed to fill a void for a working simple model. Computed results compare favorably with U.S. economic data around 2007. Qualitative features of the computed business cycle include a period of 5 years, an expansion of 3 years, and recession of two years. We introduce variable wage and labor time constants, depending on position within the business cycle. Actual and computed leading, coincident, and lagging economic time series are illustrated and compared. Our results indicate that actual business cycles are most likely never in equilibrium with unsteadiness always present. This feature may explain why various qualitatively similar business cycles are never the same.

Introduction and Motivation

Understanding the business cycle is important for policy makers, central bankers, business decision makers, and everyday citizens. Clearly, expansion and recession phases of the overall economy have significant implications for income, expense, and opportunity. The last U. S. recession, from December 2007 to June 2009 (NBER, 2011) was difficult for many business owners, employees, and bankers because available credit fell as unemployment and mortgage defaults rose. The high cost of unemployment, lost production, lost confidence, and increase of business uncertainty is not quantifiable and cannot be quickly regained. The Federal Reserve is charged with managing the business cycle through mandates to provide both employment and price stability. Yet, comprehensive Federal Reserve business cycle models and or policy may be incomplete as the last recession was the most severe since the early 1930s. The motivation for developing our math model of business cycle dynamics is that a working simple model could not be identified from an extensive literature search.

Business cycle literature is reviewed in Section 2. In Section 3, we develop our math model of the business cycle dynamics. In Section 4 we discuss general observations about the U.S. economy including Gross Domestic Production (GDP) distribution. Also, national income accounting is briefly reviewed as it pertains to the present work. We compute business cycle variables around 2007 and compare with actual values in Section 5. We summarize the paper in Section 6.

Literature review

Three theories that try to explain business cycles and growth include: neo-classical or exogenous, real business cycle (RBC), and endogenous business cycle (EBC). These theories are briefly reviewed below.

The first aggregate production function is developed by Cobb and Douglas (1928). They curve fit U.S. manufacturing sector data from 1899 to 1922 and determined that GDP (Y) = b $L^{3/4} K^{1/4}$ (1928:155), where b is independent of labor (L) and capital stock (K). This formula illustrates how labor and capita stock characterize production level, GDP or Y. Samuelson (1979) suggested that the exponents in the aggregate production function are fundamental and come from an income distribution result. Felipe and Adams (2005: 433) showed that the Cobb-Douglas production function exponents can be derived from an income accounting identity where real value added equals total wages and total profits. Neo-classical growth models usually converge to a steady state growth rate consistent with external (to the model) labor force and technology growth.

The Harrod (1939) - Domar (1946) model was an early neo-classical exogenous (outside the model) growth model. Their model determines that production growth rate equals savings rate times the marginal product of capital (Y/K) minus depreciation rate. In this model the ratios of capital/output (K/Y) and the capital/labor (K/L) are fixed. Solow (1956) and Swan (1956) both independently extended the Harrod - Dommar model by adding labor as a factor of production with a Cobb-Douglas function. Solow introduces a time or technology dependent scale factor, A(t), in a Cobb-Douglas function (1956:85), and employs variable K/Y and K/L ratios. Solow (1957) computes that A(t) varies from a reference value of 1.0 in 1909 to 1.81 in 1949. He finds the increase in A(t) due to an increase in the level of technology that is exogenous to the model. For the same data, Solow (1957: 318) crafted a mathematical relationship, employing the Cobb-Douglas function, between dependent variable Y/(LA) and independent variable K/L. He fit a log equation to the data. This equation can be reformulated into a Cobb-Douglas function with a 0.647 exponent on L and a 0.353 exponent on K. When the exponents in a

Cobb-Douglas function add to one, production, Y, increases by 100% when labor, L, and capital stock, K both increase by 100%. This feature is called constant-return-to-scale.

Real business cycle (RBC) models have business cycle drivers of external or exogenous "real" (not monetary) shocks and assume the economic system is otherwise stable, see Kydland and Prescott (1982). They combine growth and business cycle theory. Exogenous stochastic components can be technology shocks. These models typically seek to replicate statistical features of the U.S. business cycle. A common approach is to detrend time series with a filter like Hodrick and Prescott (1980) prior to computing statistics. Employing U.S. data from 1950-1 to 1979-II, Kydland and Prescott find that standard deviations in % about their mean are: output 1.8%, investment 5.1%, total consumption 1.3%, and total hours worked 2.0%. Their correlation coefficient, R^2, vs. real-output are: total consumption 0.74, fixed investment 0.71, and total hours worked 0.85; see Kydland and Prescott (1982: 1365). Their model results are consistent with U.S. macro time-series standard deviations. Their model calibration consists of searching a set of model variables (4 preference parameters, 9 technology parameters, and 3 shock variances) to explain covariances of cyclical components.

Endogenous business cycle (EBC) growth theory assumes that internal factors like research and worker training can increase growth rate. Exogenous shocks are not considered. Hallegatte (2008) presents a small system of ordinary differential equations (NEDym) to model the business cycle without growth. He presents results compared to the 2001 EU economy. The cyclical business cycle behavior in NEDym is driven by an investment – profit instability. Of the models investigated in the literature, NEDym is small complete business cycle model and it's steady state results are compared with 2001 EU-15 observed values. NEDym advances the static model of Solow (1956) by adding time dependency. We determine that the NEDym model is a good starting point notwithstanding its nonphysical wage and price predictions, see below. Our model differs from the NEDym model in that we replace the physics driving the business cycle and several of it's governing differential equations.

Leading, coincident, and lagging indicators are compiled by the Conference Board (2000) and are closely watched by the economics community. Yamarone (2004:52) reports that, from 1960 to 1991, leading indicators that suggest future trends generally peak 3 to 15 before the coincident or business cycle peak. Lagging indicators, follow GDP from 9 months lead to 13 months lag. Also, leading indicators generally peak 1 to 8 months before the coincident or business cycle trough. Lagging indicators lag from 3 to 21 months after business cycle troughs. Thus, there is a wide variation in leads and lags referenced to the GDP or coincident indicator peaks and troughs.

Business cycle variability in terms of duration has been examined by Author 1_b and Author 2_c (2009) over 32 U.S. business cycles. They find that, while each business cycle is different, recession and expansion duration correlates with total business cycle duration. Of these 32, they find 26 business cycles are "normal" and 7 are "super-recessions". Normal recessions have recessions shorter than expansions and super-recessions have recessions longer.

Business cycle dynamics model, BuCDyn

The present work develops a manageable business cycle model without trends. We ignore: politics and external exogenous shocks, government spending, export and import flows, banks or bond interest, technology or productivity gains, and maximum labor supply changes. We assume two households of capitalist and consumers. The sum of capitalist money supply, F, and consumer money supply, M, is assumed constant.

This pure cycle approach makes it difficult to compare computed results directly with actual U.S. data due to increasing: price level, technology gains, and maximum labor supply increases. For example from 1951 to 2009, the U.S. productivity factor, A, increases from 0.025 to 0.16 and price level, p, increases by a factor of 9 over this period. These long-term trends are ignored in the BuCDyn model. The business cycle variables that normally have units of $ are divided by price level in the model such that their units are quantity or amount. An equation for price level, p is included to obtain units of dollars.

As indicated above, our math model is based partly on the NEDym model, with several important changes. We change several NEDym equations because it predicts unrealistic wage changes and price levels. We worked with a version of the NEDym model with no resolution of these issues. For example, NEDym predicted nominal wages for the 2001 EU are plus and minus 55% relative to the mean nominal wage over a business cycle with α_{inv} of 1.7 (Hallegatte 2008: 71). Price levels oscillate from 2 to 18 with α_{inv} of 2.5 (Hallegatte 2008: 69). And much higher nominal wage oscillations, from 0 to 250, are computed for $\alpha_{inv} = 10$ (Hallegatte 2008: 72).

Wage-employment equations

We develop wage and employment governing equations first examining predator-prey concepts and finishing with final wage-employment equations. We incorporate a nonlinear Phillips equation to quantify wage and employment changes.

Lotka (1920) and Volterra (1926) both formulated two differential equations that, when solved, provide periodic oscillations for two competing "populations" y and x, see below. Because of their application to biological populations these equations (1) and (2) are sometimes known as predator-prey equations, see Table 1. The prey is $x(t)$ and predator is $y(t)$. Time is t, and a_1, b_1, a_2, b_2 are constants. The interaction, or xy term, is positive for the predator and negative for the prey differential equations. In the prey differential equation (2), if the predator, y, is zero the prey, x, will increase. Similarly, in the predator differential equation (1), if the prey, x, is zero the predator, y, will decrease.

The predator-prey model suggests a form of the wage and employment differentials equations for our business cycle model. We employ two coupled differential equations for employed labor ratio, λ, and total wage ratio to pY, i.e. $W/(pY)$. These two equations are sufficient for a business cycle to cycle. Goodwin (1967) modeled the worker pay and employment level as a predator-prey system. Keen (1995: 615) employs a related set of equations. Wage change is generally positive when employment, λ, increases, and conversely wage change is generally negative when employment, λ, decreases. The relationship between wages and employment is a Phillips curve or equation, $P(\lambda)$. We modify Keen's Phillips equation constants, $P(\lambda)$, see equation (3). This modification is to practically limit maximum λ to 1.0.

The following governing differential equations for wages and employment follow from equilibrium statements. When employment is in equilibrium, i.e. $P(\lambda) = 0$, there is no change in total wages, W. The conservation equation for total wage ratio is (4). When wages are in equilibrium, e.g. $W_0 = (W/pY)$ there is no change in employment. Here W_0 is a constant in the present model. The conservation equation for employment ratio, λ, is (5). Once λ is computed the employed labor supply, L, is known from (6).

Table 1 BuCDyn wage-employment equations

Predator: $d/dt\,(y) = -a_2 y + b_2 xy$	(1)
Prey: $d/dt\,(x) = a_1 x - b_1 xy$	(2)
$P(\lambda) = 1/[1-\lambda]\,\exp\,(-57.911 + 55.162\,\lambda) - 0.0478$	(3)
$d/dt\,(W/pY) = (W/pY)[P(\lambda)]\,/\tau_{wag}$	(4)
$d/dt\,(\lambda) = \lambda\,[(W_0 - (W/pY))/v\,]\,/\tau_{emp}$	(5)
$L = \lambda\,L_{max}$	(6)

The wage and labor differential equations (4) and (5) are fundamental to our business cyclical model. The coefficients on the right hand side of (4) and (5), and initial conditions govern the business cycle trajectory in W/pY vs. λ coordinates (see below). Our development of (4) and (5) is a progression from Goodwin's (1967) and Keen's (1995) wage and labor models. In the Goodwin and Keen models, capitalists invest all of their profits, i.e. $W_0 = 1$, and the two respective time constants are 1.0. Here we define the equilibrium wage divided by price level times Y (to get dollars); W_0, is assumed to be 0.60. Time constants for wage (employment), τ_{wag} (τ_{emp}), are chosen to be variable and either 1.0 or 1.5 years (1.5 or 1.0) depending if the right hand side of (5) is positive or negative respectively. With time constants greater than one, the magnitude of the right hand side terms of (4) and (5) decrease and the solution time to equilibrium increases. In the NEDym model both time constants are 2 years. In Keen τ_{wag} and τ_{emp}, are 1.0, and $v = K/Y$. Here we define $v = AK/Y$. The wage-labor orbit or trajectory quickly stabilizes as is discussed below.

Governing Equations

The process of computing business cycles with differential equations is called "computational business cycle dynamics" here. Ordinary differential equations for rates of change of goods inventory, G, price level, p, capitalist money stock, F, capital stock, K, and consumer money stock, M, are listed below. These follow Hallegatte (2008) where possible. In addition to these variables, Hallegatte employed a differential equation for producer investment ratio, Γ_{inv}, to control the business cycle amplitude and period. In the NEDym model, business cycles are due to an investment vs. profit instability.

To address NEDym's unrealistic wage and price behavior noted above, we replace it's wage and employment equations with (4) and (5). In the process we replace the NEDym investment vs. profit instability business cycle driver with a natural oscillation between wage change and employment change. We also replace NEDym's differential equation for producer investment ratio, Γ_{inv}, with an algebraic equation, see below. And we replace NEDym's linear Phillips equation with a nonlinear equation. In summary we replace three of seven of NEDym's governing differential equations, replace the physics driving the business cycle, replace the Phillips equation, redefine the producer investment ratio Γ_{inv} and introduce variable wage and employment time constants. The BuCDyn equations are (3)-(24) in Tables 1 and 2.

In equilibrium, the rate of change of goods inventory, G, is zero, i.e. production, Y, equals demand, D. Thus, the conservation equation of G, or rate of change of G, is (7), see Table 2. Several identity algebraic equations are also needed.

We follow NEDym where possible. Consider that demand, D, equals consumption, C, plus investment, I, see (8). The conservation equation of price level, p, is assumed to be negatively proportional to goods inventory, G, divided by demand, see (9) where the proportionality constant is α_p = 3.6E-03. Production, Y, is assumed to be dependent on a constant technology coefficient, A, total labor, L_{max}, (in millions of workers) and capital stock, K (in trillions of $), and is modeled by a Cobb-Douglas (1928) equation, see (10). For this zero growth economy, constant productivity, A, maximum labor, L_{max}, and sum of money supply are constant. In equilibrium, the consumer's income of wages plus dividends are consumed and/or saved. Thus, the rate of change of consumer money stock, M, is equal to total wages plus dividends minus price consumption minus savings, see (11). Total wages, W, are determined from the wage differential equation (4) solution. Capitalists use a portion of F, α_F, to pay for physical investments, pI, and dividend, Div, payout, see (12).

Our constant coefficients are consistent with the NEDym model except where noted. Dividends are computed from (13). We assume investment is dependent on investment ratio, Γ_{inv}, using rate of capitalist money stock, α_F, and capitalist money stock, F, see (14). Thus, dividend, Div, is dependent on investment ratio, Γ_{inv}, and producer liquid assets, α_F, assumed to be 0.2, and capitalist money stock, F, see (15). We define the investment coefficient Γ_{inv} to be proportional to normalized gross profits, ξ_p, see (16). We define normalized gross profit, ξ_p, to be gross profits, Π, per unit GDP in $, pY, plus a constant of 0.2 to insure positive values, see (17). Our equation for Γ_{inv} is different where Γ_{inv} is determined in NEDym by solving an ordinary differential equation. Gross profits, Π, are total sales, p D, minus total labor costs, W, see (18). Consumer consumption, C, is proportional to (1 - savings ratio) times consumer stock of money, M, see (19). Where the savings rate, γ_{save}, is assumed to be constant at 0.3 and the using rate of consumer money stock, α_M is assumed to be 0.2. Consumer savings, S, is assumed to be proportional to consumer money stock, M, see (20).

In equilibrium investment, I, equals capital stock, K, minus depreciation. Depreciation is assumed to be capital stock divided by the capital stock depreciation years. We assume a useful life of capital stock of 20 years and the time constant, τ_{dep}, is 20 years. The conservation of capital stock K, or rate of change of K, is investment, I, minus depreciated capital stock, K, is given by (21). At equilibrium, gross profits, Π, plus consumer savings, S, equal payouts of dividends, Div, and investment, pI. Thus, the rate of change of capitalist money stock, F is given by (22). Because the total money supply is assumed constant, the rate of change of consumer money stock, M, is equal and opposite of the rate of change of capitalist money stock, F, is given by (23).

By examining quarterly U.S. data from 2004 to 2010, we conclude that goods inventory, G, is usually quite close to zero. Employing G=0, we compute the using rate, α_M, of consumer money stock, M, endogenously as part of the numerical solution, see (24). For the U.S. 2007 solution presented below the using rate, α_M of consumer money stock, M, varies around 0.20. In Hallegatte (2008) α_M is 0.2.

Table 2 Other BuCDyn equations

|	
$dG/dt = Y - D$	(7)
$D = C + I$	(8)
$dp/dt = - p\,\alpha_p\,G/D$	(9)
$Y = A\,L^{2/3}\,K^{1/3}$	(10)
$dM/dt = W + Div - (pC + S)$	(11)
$pI + Div = \alpha_F F$	(12)
$Div = \alpha_F F - pI$	(13)
$I = \Gamma_{inv}\,\alpha_F F/p$	(14)
$Div = \alpha_F F - \Gamma_{inv}\,\alpha_F F = (1-\Gamma_{inv})\,\alpha_F F$	(15)
$\Gamma_{inv} = 0.5\,\xi_p$	(16)
$\xi_p = \Pi/(pY) + 0.2$	(17)
$\Pi = p D - W$	(18)
$C = (1-\gamma_{save})\,\alpha_M M/p$	(19)
$S = \gamma_{save}\,\alpha_M M$	(20)
$dK/dt = I - K/\tau_{dep}$	(21)
$dF/dt = \Pi + S - Div - p I$	(22)
$dM/dt = - dF/dt$	(23)
$\alpha_M = pAL^{2/3} K^{1/3}/[(1-\gamma_{save})\,M] - \Gamma_{inv}\,\alpha_F F/[(1-\gamma_{save})\,M]$	(24)

The U.S. economy, circa 2007

In this section, a general view of the U.S. economy is presented in terms of GDP distribution. National income accounting as is pertains to our two household model is discussed. Consumption of goods and services by domestic households account for about 2/3 of GDP, Y. Consumer consumption is the sum of: consumer consumption (durables, non-durable), government goods and services, and net exports. Government spending for goods and services accounts for about 1/5 of GDP, Y. Investment spending for new capital stock (fixed investment) plus inventory investment accounts for about 1/6 of GDP, Y. Investment is made up of both business and residential fixed investment, and inventory investment. The capital stock for the U.S. is typically 2.4 to 3.2 times Y from 1951 to 2010-II. Average capital stock for 2007-2008 from BEA (2010) is $44.56 trillion. Total wages are the sum of wages & salaries. National income is the sum of total wages and corporate profits. There are three different approaches to national income accounting that provide identical results. These are product, income, and expenditure. These approaches are the same because total production = total income = total expenditure. Gross domestic product = gross national product – net factor payments from abroad. In BuCDyn, there are no payments from abroad so GDP = GNP. The expenditure approach computes GDP, Y from consumption, C, investment, I, government purchases of goods and services, G, and net exports, NX, or exports - imports. In BuCDyn there are no G or NX so Y = C + I. In national accounting, real GDP, Y, is adjusted for price change to reflect only quantity changes.

Because there are no government spending or goods in our math model, the U.S. values from BEA, Table 2.1 (2010), are adjusted as if there is no government spending and these results are compared with the calculations. Therefore, the 2007 values, on a simplified accounting system with no government, are: (a) GDP = $13.84, consumption (no government) = consumption + government goods & services + exports + imports = 9.73 + 2.69 + 1.64 –2.35 = $11.72, (b) investment (no government) = investment + inventory = 2.13 + 0 =$ 2.13, (c) wages (no government) = wages and salary + 0.67 proprietors income + business current transfer payments + current surplus of government enterprises = 7.87 + 0.67 (1.63) + 0.09 – 0.01 = $9.04, (d) corporate profits (no government) = corporate profits + 0.33 proprietors income + rent + net interest + taxes on output and imports = 1.6 + .33 (1.63) + 0.07 + 0.96 = $3.77. Proprietor's income is partly attributed to wages and partly attributed to profits. Values are in trillions of dollars.

GDP, demand, consumption, total wages, investment, fixed investment, corporate profits, employment, and dividends for U. S. business data from 2004-II to 2010-II are illustrated in Fig. 1, respectively. Total wages/GDP vs. employment, quarterly data 1948 to 2010 are illustrated in Fig. 2. For the time between 2006-I to 2010-II, W_0 is approximated from Fig. 2 to be 0.60. It is a wage/pY symmetry value. This value appears to vary slightly from 0.60 to 0.63 for the last 62 years. In the total wage, we include 0.67 of proprietor's income. The total range in employment ratio is from 0.89 to 0.975 and wage ratio varies from 0.59 to 0.65 over these decades. Specific trajectory paths of wage vs. employment most likely relate to specific U.S. circumstances including labor productivity and labor strengths. Our calculation computes a single trajectory in the total wage vs. employment space as indicated below.

Fig. 1 U.S. business cycle data from 2004-II to 2010-II, GDP, demand, consumption, total wages, investment, fixed investment, corporate profits, employment, and dividends (data source: BEA, T 1.12, 2010)
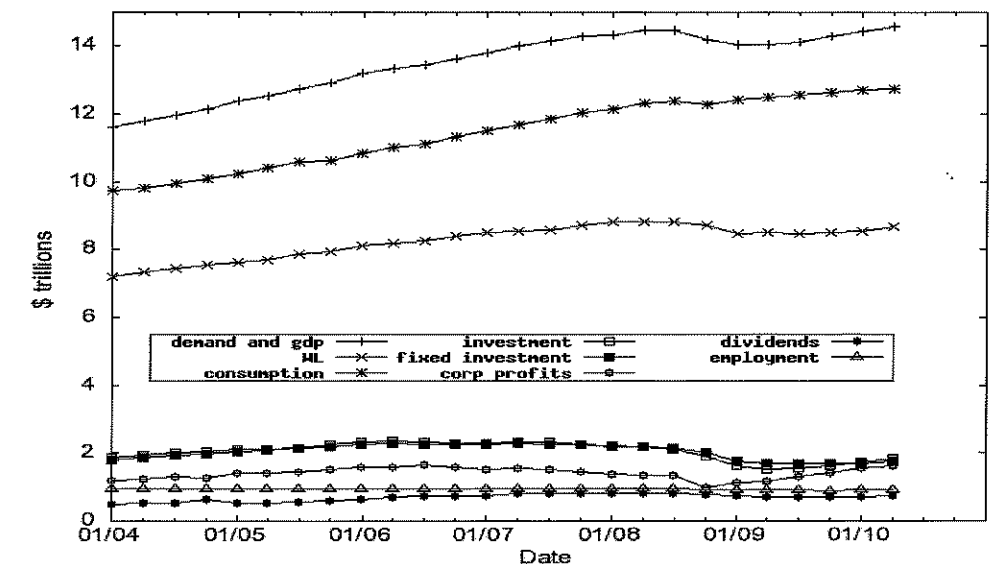
The time series of Fig. 1 are segregated into leading, coincident, and lagging time series in Fig. 3-5. The variables are scaled between 0 and 1 by employing maximum and minimum values over a complete business cycle from troughs from 2001 to 2009. The normalized values are: y = (Y-Ymin)/(Ymin – Ymax). In this non-dimensional manner, business cycle data are easier to compare with our purely cyclical numerical calculation results below.

Phase lag designation is with respect to industrial production index. Industrial production index, IPI is used in place of GDP where IPI has units of amount. It is determined qualitatively around the maximum IPI of December 2007. From these non-dimensional time series, we conclude that the U.S. data leading variables are gross profits and investment. Coincident variables are IPI, demand, and employment. And lagging variables are: consumer consumption, dividends, and wages. The phase lead/lag, between leading, coincident, and lagging time series is not constant throughout the business cycle. As discussed in the section 2 lead and lag times are highly variable over different business cycles and lagging indicators sometimes become leading indicators.

Fig. 2 Total Wages/GDP vs. employment, quarterly data 1948 to 2010, total wages assume 0.67 of proprietor's income (data sources: U.S. Department of Labor, 2010, Table 1.12)
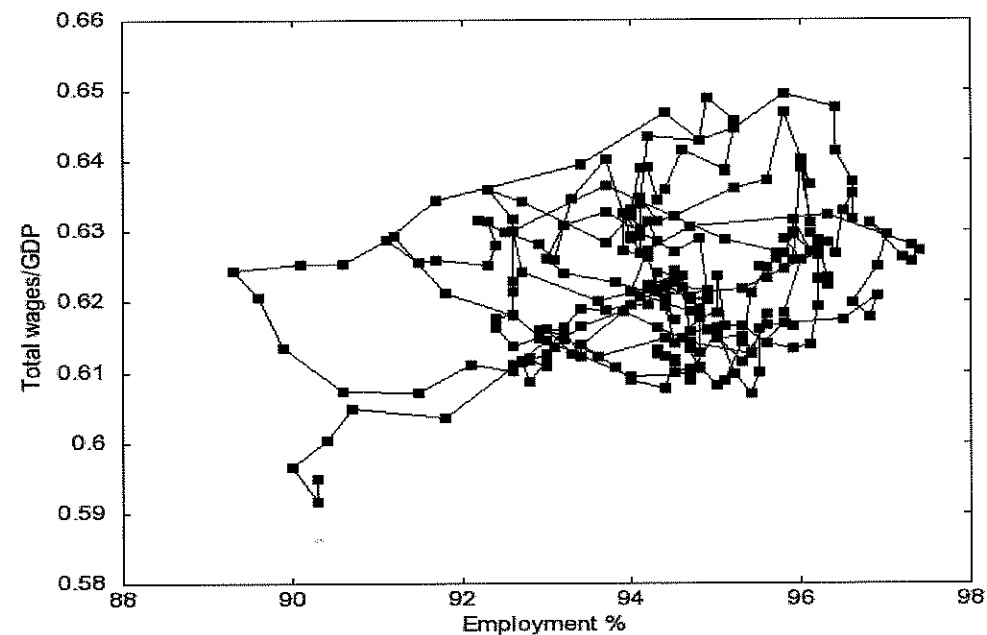
Fig. 3 Leading U.S. time series industrial production index, gross profits, investment and employment, normalized (Y-Ymin)/(Ymin – Ymax) within the last business cycle troughs in 2001 to 2009 (data source: BEA, 2010, T 1.12, Board of Governors of the Federal Reserve System, G17, IPI)
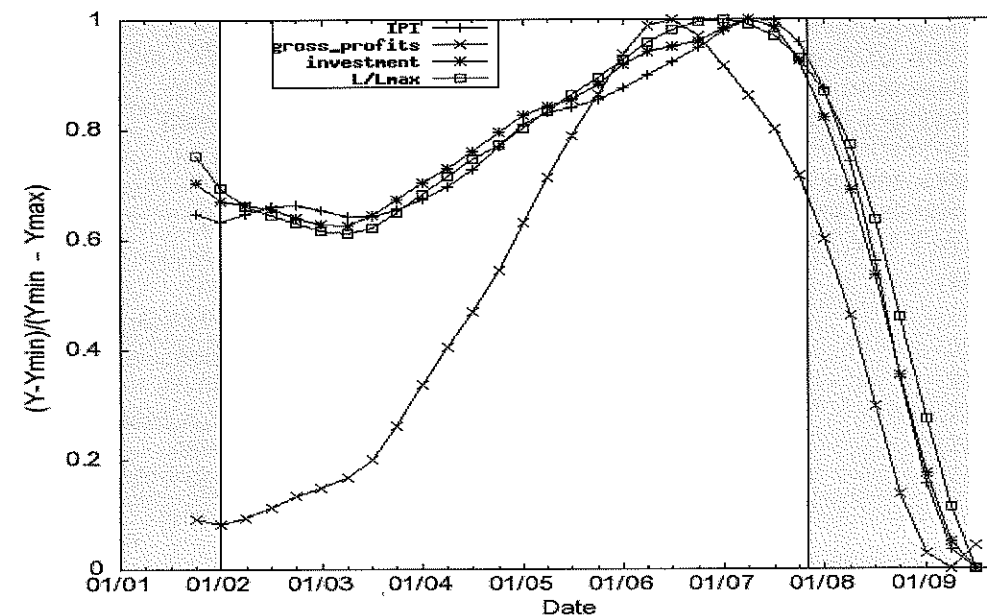
Fig. 4 Coincident U.S. time series industrial production index and wages, normalized (Y-Ymin)/(Ymin – Ymax) within the last business cycle troughs in 2001 to 2009 (data source: BEA, 2010, T 1.12, Board of Governors of the Federal Reserve System, G17, IPI)
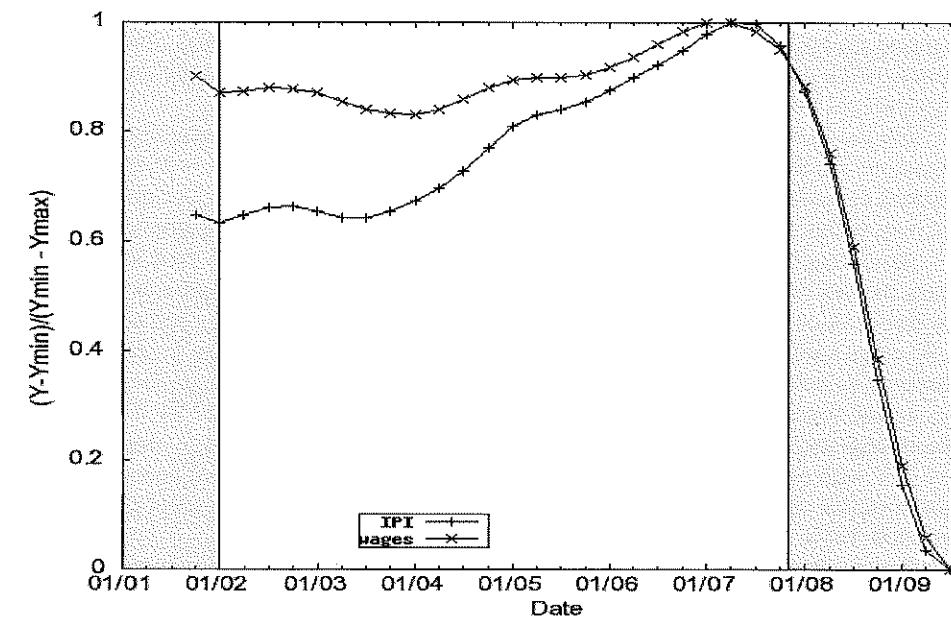
Fig. 5 Lagging U.S. time series industrial production index dividends, and consumer consumption, (Y-Ymin)/(Ymin – Ymax) within the last business cycle troughs in 2001 to 2009 (data source: BEA, 2010, T 1.12, Board of Governors of the Federal Reserve System, G17, IPI)
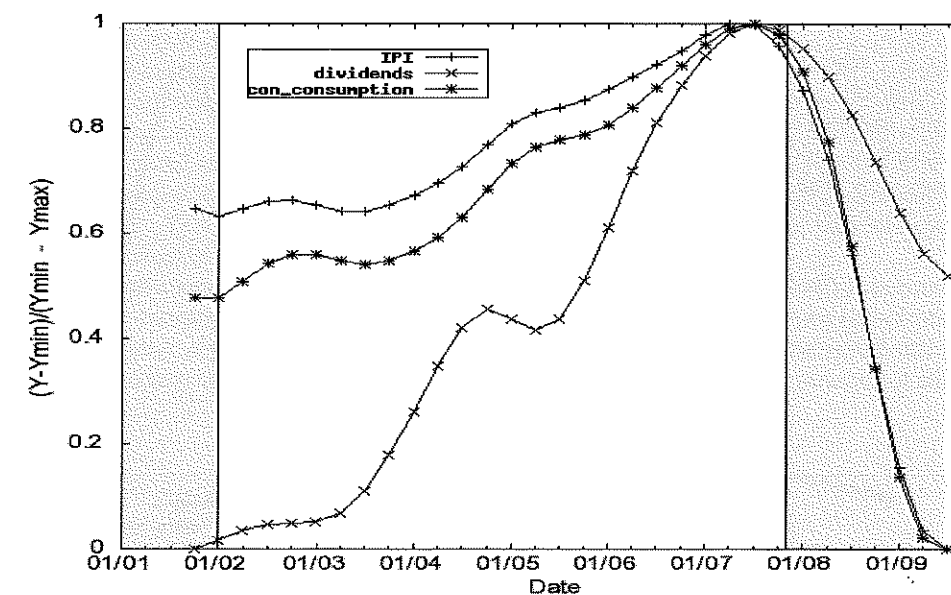
Prediction and data comparison

A picture is presented above of highly variable business cycle attributes. In contrast to this unsteady and changing process, we model and compute a specific steady state business cycle by solving the system of equations (3) – (24) with initial conditions until the time series are repeatable (see below). Initial conditions selected for the 2007 US business cycle example are: $F_0 = 53.61$, $G_0 = 0.0$, $K_0 = 60.66$, $L_0/Lmax_0 = 0.9$, $P_0 = 1.$, $W_0/Y_0 = 0.60$, $M_0 = 43.29$. The numerical integration procedure we employ is time accurate. In computing the 2007 U.S. economy with different money stock sums of capitalist and consumer money stock, F + M, we find that the final value of F is relatively insensitive to the initial sum of money stock. The initial value of M is judiciously selected to get a reasonable savings value.

A goal of the computer simulation is to obtain a cycling, steady state, non-trending business cycle. In order to obtain this, the computer program is run for a long time to "wash out" the unsteadiness to get purely cyclical results. This also means that capital stock, K no longer trends. Depending on initial conditions, this equilibrium time might take 80 or 100 years. These

calculations typically take less than one minute on a desktop XP computer. Unsteady interactions within the business cycle system need a long time to settle out before achieving a steady state periodic oscillation. Thus, we conclude that actual business cycles are never in equilibrium and unsteadiness always present. This conclusion may explain why various business cycles, while qualitatively similar, are never the same. . This impedes the comparison between actual and computed steady state cyclical time series.

For the U.S. we find that inventory, G, is kept at zero by capitalists. Thus G is small and set to 0.0 in the math model. Therefore for the solution below we set dG/dt (7) to zero, dp/dt (9) = 0, and price level, p, is 1.0. Experimentation with nonzero G leads to reasonable price and wage values, with equation (9) employed. Thus, we think the price equation (9) is not responsible for the nonphysical large price level and wage level changes computed by Hallegatte (2008).

According to the NBER (2011), the last business cycle (or GDP) peak was December 2007 and trough was June 2009. Thus, the last recession was about 18 months. The computer output time is referenced such that the zero year corresponds to the end of December 2007, i.e. at the start of the last recession. Positive and negative years are relative to this date in Figs. 6-8. Average values over the last year in the computer model, from −1 to 0 years are listed in Table 3. The average 12-month observed values are listed both with and without government accounting. Averaged 12-month computed GDP is the same as the actual value of $13.84 T. Computed average total wages of $7.94 T compare with $9.04 T with no government accounting and $7.86T with government accounting. Computed average consumer consumption of $10.66T compares with $11.72T with no government accounting and $9.81 T with government accounting. In general, the computed average 12-month values compare well with the no government accounting case, except gross profits and dividends are over predicted as shown in Table 3.

Fig. 6 illustrates how the computed GDP varies through out the computed business cycle. The variation with time is asymmetric. Computed recession is from 0 to 2 years where GDP drops. Computed expansion is from 2 to 5 years where GDP rises. Computed GDP is repetitive and the business cycle is in steady state.

Fig. 6 Computed GDP around 2007, period is 5 years, expansion 3 years before peak, and recession 2 years after peak
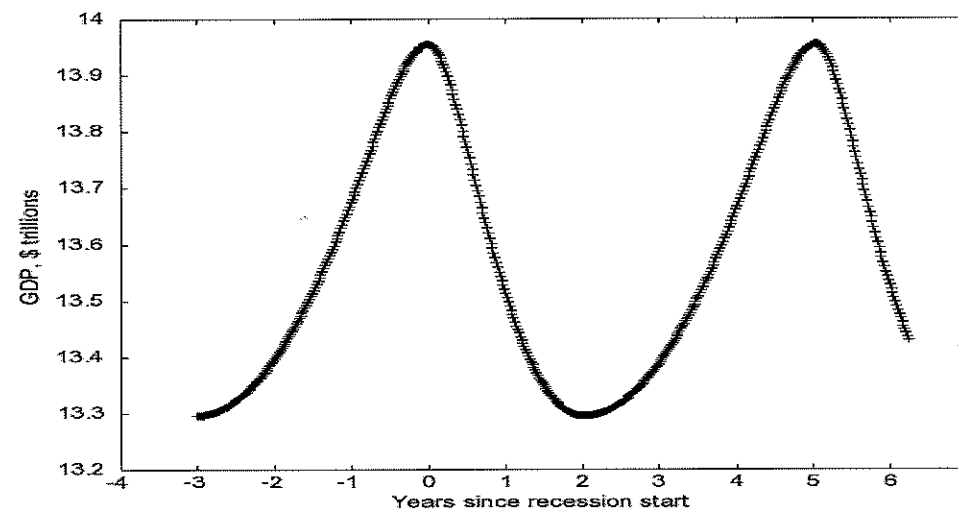
When in steady state capital stock, K, no longer changes and Investment, I, = K/τ_{dep}. Thus Investment, I, = 60.85/20 = 3.04. Savings, S, = γ_{save} α_M M = 2.80, see Table 2. Capital stock, K, is determined by the model solution. For U.S. data, which includes a government household, from 1951 to 2009 K/Y varies from 2.4 to 3.2. Our computed average over a business cycle K/Y = 4.4. Thus, our computed steady state capital stock is higher than actual data. It is possible that the actual U.S. capital stock, K, reported as 44.56 is not a steady state value.

The 2007 U.S. total income with no government (W + Div or 9.04 + 4.81) is $13.85 T, see Table 3. This is the same as GDP, Y $13.84 T. Of the available money (S + Π or 2.13 + 3.77) $5.90 T, part is distributed to capital investment, I, and the rest to dividends (I + Div) for a total of $6.94 T. This is more than the available money $5.90 T by about $1.04 T.

Final conditions at t_{max} of 120 years are: F=50.13, G=0.0, K = 60.72, L = 147.2 M, P = 1.0, W/Y = 0.62, M = 46.77. Conditions averaged over the last business cycles are: F =50.28, G =0.0, K = 60.85, L/Lmax = 0.953, p = 1.0, W = 7.94, M = 46.62, GDP, Y = 13.84. These are in units of $T, except price level in $, and dimensionless ratios.

Cyclical steady state computations, after initial transients have died out, are illustrated in Fig. 7. These values compare with Fig. 1.

Table 3 U. S. 2007 business cycle, simplified with no government, and computed with BuCDyn

Business cycle variable symbol	Description	2007 computed, averaged over 12 mo. before peak	2007 observed values, with no government accounting	2007 observed[a] values, averaged over 4 quarters
Y = D	Production=demand	13.84	13.84	14.06
λ = L/L$_{max}$	Employed worker /153.121	0.953	0.95	0.95
W	Total annual wages	7.94	9.04	7.86
C	Consumer consumption	10.66	11.72	9.81
S	Consumer savings	2.80 ($S = \gamma_{save}\ \alpha_M$ M)	2.13 (S = I)	2.66
Π	Gross profits	5.88	3.77	1.51
Div	Annual dividends	6.90	4.81 (Div = C + I -W)	0.79
K/τ_{dep}	Consumption of fixed capital, depreciation	3.04	1.69	n.a.
I	Physical investment	3.16	2.13	2.78
K[1]	Capital stock	60.85	n.a.	44.56
F[2]	Capitalist money	50.28	n.a.	n a
M[2]	Consumer money	46.62	n.a.	n a

Note: units are trillions of U.S. dollars except ratios that have no units. [a] Source: BEA (2010).

As illustrated in Fig. 3-5, actual business cycle data from October 2001 to July 2009 indicate that leading series are investment, gross profits and employment. Coincident series are GDP and wages. Lagging series are dividends and consumer consumption. As illustrated in Fig. 8, non-dimensional scaled 0-1 results indicate that the leading series are investment and gross profit. Coincident series are GDP, employment, and consumer consumption. Lagging series are dividends and wages. Thus there is agreement on the phase between actual and calculation for leading series of investment and gross profit. GDP is a coincident series by definition. Also there is agreement for lagging series of dividends. There is not phase agreement for employment, wages, or consumer consumption. This lack of agreement might be associated with the actual business cycle not being in a steady state periodic cycle as previously mentioned.

Computed wage share vs. employment is presented in Fig. 9. As illustrated, actual data from 2006-I to 2010-II is similar to the upper portion of the trajectory. A closed counter-clockwise processing trajectory of wage vs. employment is indicated. The overall computed magnitude of both the wage share and employment variation encompasses most of the actual data in Fig. 3. We think the current simulation is representative of the present business cycle where the employment variation is from 0.89 to 0.97.

Fig. 7 Computed GDP around 2007, period is 5 years, expansion 3 years before peak, and recession 2 years after peak, gross domestic product, total wages, dividend, gross profits, and investment
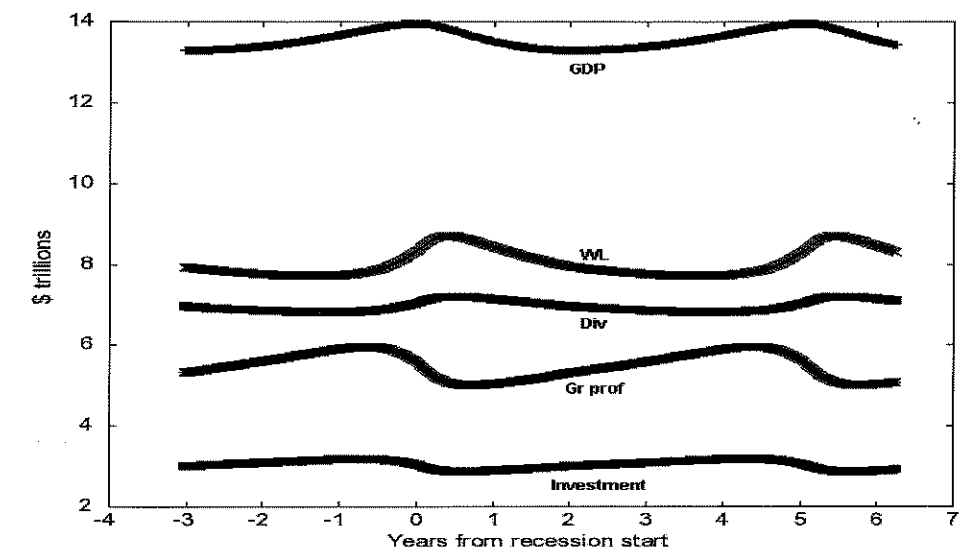
Fig. 8 Computed non-dimensional business cycle vs. years from start of recession, leading series are investment and gross profits, coincident series are consumer consumption, employment, and Gross Domestic Product, lagging series are dividends and total wages
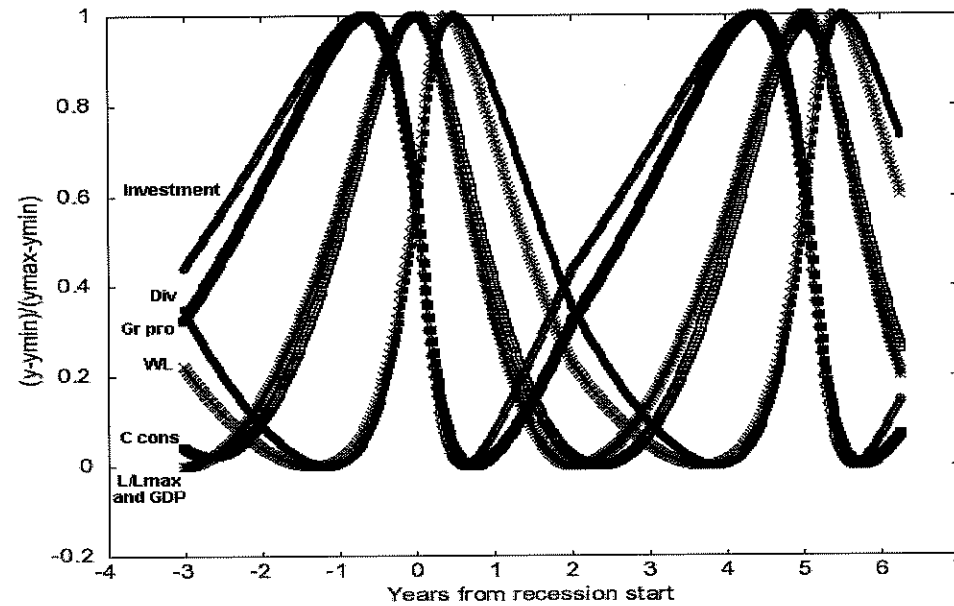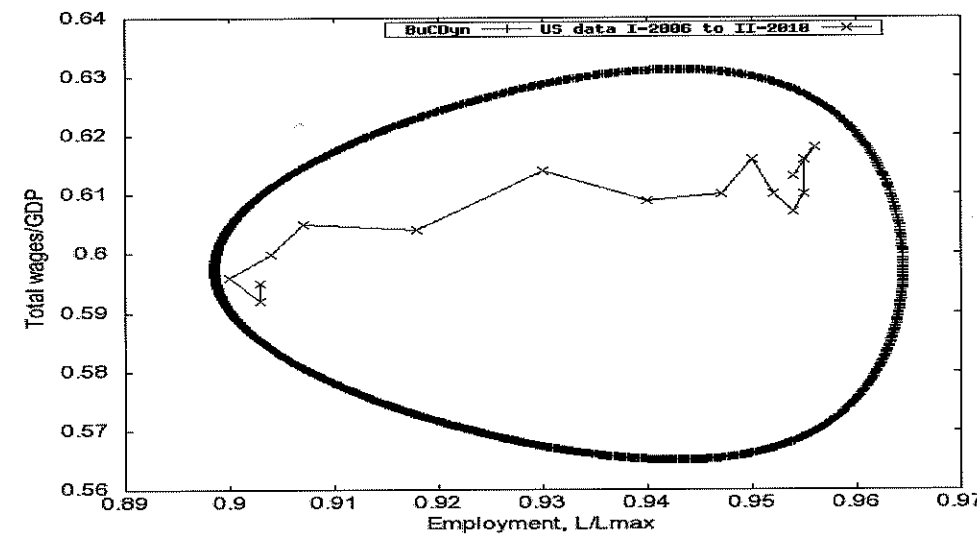

Fig. 9 Computed total wages/GDP vs. employment, U.S. data from I-2006 to II-2010, procession is counterclockwise (data source: U.S. Department of Labor, unrate, and BEA table 1.12)

The computed investment/GDP ratio vs. gross profits/GDP is illustrated in Fig. 10 to cycle in a nonlinear fashion and is double valued. This behavior is reasonable given that the business cycle is repetitive when in steady state. The procession is clockwise. Although not illustrated, the computed investment ratio, Γ_{inv}, varies non-sinusoidally from 0.285 to 0.318 over the business cycle.

Fig. 10 Computed investment/GDP vs. gross profits/GDP, procession is clockwise
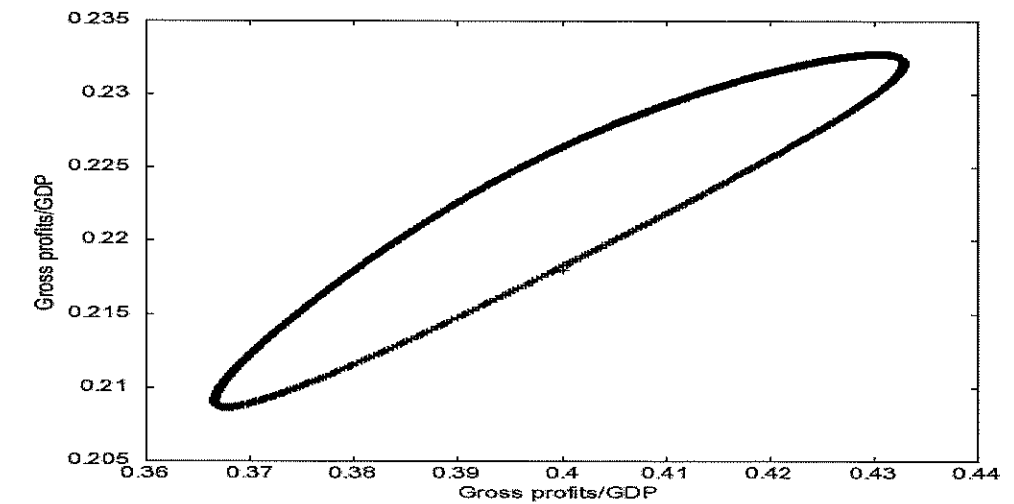
Summary and conclusions

Computed business cycle values are compared with observed U. S. 2007 values. The computed business cycle is asymmetric with a period of 5 years, expansion of 3 years and recession of 2 years. In general, the computed average 12-month values compare well with the no government accounting case. These include: GDP, total wages, consumer consumption, consumer savings, and physical investment. These results are encouraging. However, gross profits and dividends are over-predicted by the model. We compute the business cycle until the cycle becomes repetitive and call this steady state. When steady state is reached, computed capital stock no longer changes. Time to reach this steady state is 80 to 100 years depending on initial conditions. In spite of the large number of years computed, actual computer solution time is less than one minute on a desktop computer. The numerical integration procedure is time accurate and the model could be employed to analyze the interactions throughout the equilibration process. Because of this long time needed to reach steady state, we conclude that actual business cycles are never in equilibrium and unsteadiness is always present. This feature may have profound influence over how "unsteady" business cycles are examined in the future. Further, it is obviously more difficult for a central bank to control an unsteady process than to control a steady state process.

The physics that controls and drives the BuCDyn business cycle is an interaction between labor change and wage change. Economies with different employment vs. wage characteristics, due to different work ethics or other issues, would have different business cycle characteristics. These characteristics may be dynamic. The computed wage-labor orbit/trajectory is quite stable and quickly becomes repetitive. This is in contrast to the long time required for other economic time-series to steady out. The phase lead/lag, between leading, coincident, and lagging time series is not constant throughout the business cycle.

Actual business cycle data from October 2001 to July 2009 indicate that leading series are investment, gross profits and employment. Coincident series are GDP and wages. Lagging series are dividends and consumer consumption. Calculations indicate that the leading series are investment and gross profit. Coincident series are GDP, employment, and consumer consumption. Lagging series are dividends and wages. Thus, there is agreement on the phase between actual and calculation for leading series of investment and gross profit. Also, there is agreement for lagging series of dividends. There is not phase agreement for employment, wages, or consumer consumption. This phase disagreement may simply be another indication of unsteadiness of actual business cycle data. Thus, with interactions always present it is difficult to understand, evaluate, control, and predict actual business cycles. We think the BuCDyn model is useful to researchers and consultants to government and business. An example of use of the model would be to examine various amounts of money stock and capital stock effects on employment, wages, and production. Another use could be to examine the interaction terms, effects, and processes before the model is in steady state. The simplicity of the model is such that it can be further expanded to incorporate complexities such as changing technology and labor supply, incorporate a government household, and include bank interest.

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Acknowledgement

Merger Guideline Mania: Up, Down and Sideways

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Abstract

Various government agencies review potential mergers for antitrust violations. Only a relative handful of mergers are subject to detailed scrutiny and most of those reviews are of horizontal mergers between market rivals. Recently U.S. government agencies have stressed concerns about antitrust harms arising from vertical mergers between an input supplier and its downstream customer firm. Such a merger could potentially raise the costs of rivals of the downstream firm. In this paper I provide examples of recent studies which have addressed antitrust concerns relating to vertical mergers with particular emphasis on a recent FCC decision in the Comcast NBC merger review.

Introduction

The Big Recession has taken its toll on merger activity. In 2010 global mergers were valued at about $2 trillion or 50% less than the peak of $4 trillion in 2007. Antitrust considerations are an important aspect of merger evaluations when trillions of dollars are at stake. During this relatively slow period, US policymakers have been re-examining rules for mergers. Lax regulatory enforcement has been cited by numerous experts such as Bernanke and Yellen as a cause of the collapse of the global financial market. During the 2008 presidential election campaign, Barack Obama responded to an inquiry from the American Antitrust Institution that antitrust laws particularly in regard to mergers and acquisitions had been poorly enforced by the previous administration. Upon assuming office, Obama appointed antitrust heads at the Federal Trade Commission and the Department of Justice who shared his views.

Researchers and policymakers have evaluated how specific mergers either impact the public interest (i.e., consumer welfare) or how they impact the merging firms respective valuations. Mergers can be classified as vertical mergers (between upstream and downstream firms), horizontal mergers between rivals (sideways) or conglomerate mergers (directionless). The Federal Trade Commission (FTC) and the Department of Justice (DOJ) have primarily reviewed horizontal mergers between rivals. However, the first DOJ merger guidelines published in 1968 emphasized vertical mergers. The Guidelines stated that firms that sought a merger between a supplier with a 10 percent market share and a purchaser who accounted for 6 percent of demand upstream would be challenged unless there were no barriers to entry. Later guidelines, published in 1982 and 1984, regarded non–horizontal mergers as raising antitrust concerns only if they had horizontal consequences. Finally, the 1992 guidelines were renamed 'Horizontal Merger Guidelines,' as vertical mergers were largely ignored.

Under the leaders appointed by Obama, the antitrust agencies showed greater interest in vertical mergers. During her Senate confirmation hearing, the DOJ Head, Christine Varney, responding to Senator Charles Schumer that she "would not shy away from considering whether the vertical integration resulting from a merger of acquisition is likely to substantially lessen competition." As an FTC commissioner in the 1990s, she expressed her concerns about the possible anticompetitive effects of vertical integration in markets with networks. Two recent regulatory challenges to proposed vertical mergers, Live Nation Inc. and Ticketmaster Inc. and Comcast and NBC have resulted in extremely detailed reviews of the underlying economic conditions which could result in consumer welfare losses. In a later section of this paper, there will be a detailed review of the economic rationale used by the Federal Communications Commission (FCC) to ascertain anticompetitive harms ascribed to a merger between Comcast and NBC.

As shown in Table 1, Detailed Review of Challenged Mergers by Type and Year, which was developed from data provided in Bergman et al (2010), almost 90% of the cases reviewed in depth by US regulators during the period 1990 and 2007 resulted from challenges to proposed horizontal merger attempts. Also evident from Table 1 is the general decline in detailed regulatory challenges during the second half of the time period.

Methodology to Determine Merger Classifications and Market Valuation

Until recently there has been a dearth of valid information about the types of mergers that have occurred in the U.S. Typically the market valuation literature on mergers classifies a merger as unrelated if the bidder and target have different Standard Industry Classification (SIC) codes. A merger such as Comcast and NBC, for example would be considered an unrelated, cross industry merger since Comcast's SIC code is 4841 and NBC's SIC code is 4833. But these two industries have significant supplier (upstream) and distributor (downstream) linkages, resulting in a post-merger vertically integrated

firm. The SIC code–based method inadequately depicts whether mergers between firms with different SIC codes result in vertical integration. Without a more refined method of identifying upstream-downstream linkages, it is difficult to distinguish between vertical and conglomeratel mergers.

Table 1
Detailed Review of Challenged Mergers by Type and Year

	All Mergers	Horizontal Mergers	Vertical Mergers
1990	14 of 25	13 of 23	0 of 1
1991	7 of 15	7 of 14	0 of 0
1992	6 of 10	5 of 8	1 of 2
1993	7 of 21	7 of 19	0 of 1
1994	22 of 36	18 of 30	3 of 5
1995	24 of 35	17 of 23	2 of 2
1996	16 of 22	11 of 17	5 of 5
1997	20 of 30	17 of 25	2 of 4
1998	14 of 17	14 of 15	0 of 0
1999	24 of 32	19 of 26	2 of 2
2000	23 of 26	20 of 21	1 of 2
2001	6 of 9	6 of 9	0 of 0
2002	11 of 19	13 of 16	1 of 2
2003	7 of 10	6 of 9	1 of 1
2004	6 of 15	5 of 13	0 of 1
2005	12 of 18	10 of 14	2 of 4
2006	10 of 13	8 of 11	1 of 1
2007	11 of 15	10 of 12	0 of 0
Total	243 of 367	197 of 256	21 of 33

Recently several researchers, Fan and Goyal, (2006) and Kedia, Ravid and Pons (2009) have analyzed the market valuation of companies that merged and classified mergers as horizontal, vertical or conglomerate mergers using a new methodology. They base their merger classification on a review of the Bureau of Economic Analysis input output tables associated with four-digit SIC codes of the acquirer and target firm. If the two firms are within the same four-digit SIC code, it is clearly a horizontal merger. If the two firms have different four-digit SIC codes but the input output tables show that one industry uses a high fraction of the other industry's output in production than the merger is classified as a vertically related merger. Conglomerate mergers are those where the acquirer and target firms are not within the same four digit industry SIC codes and also there is little or no input-output relationship between the associated four-digit SIC codes of the merger partners. Fan and Goyal (2006, p.881) describe this methodology as follows: "We use the plastics, *i*, and non-textile bags, *j*, industries as an example. In 1992, the total plastics output was $31,502 million. The total output of non-textile bags was $8,389 million. The non-textile bags industry consumed $1,259 million in plastics and the plastics industry utilized $10 million in nontextile bags as input. On a per dollar basis, the non-textile bags industry consumed $0.15 ($1,259/$8,389) of plastics for each dollar of bags it produced and the plastics industry consumed $0.0003 ($10/$31,502) of bags for each dollar's worth of plastics produced. The vertical relatedness coefficient between the two industries is 0.15, which indicates the potential input transfers between the two industries on a per dollar basis." According to this methodology, any merger that occurred between firms in these two industries would be classified as a vertical merger since the vertical relatedness coefficient is relatively high.

Fan and Goyal and Kedia, Ravid and Pons noted that in recent years vertically related mergers have been an increasing share of total mergers. Fan and Goyal determined that the fraction of vertical related mergers increased from about 30% in the 1960-70s to about 45% in the 1990s. Of 514 mergers Fan and Goyal studied in the 1991-96 period, 45% had a vertically related dimension. Of 703 mergers Kedia et al. studied in the 1997-2002 period, 47% had a vertically related dimension.

Table 2 displays the Kedia results which show lower returns for vertical mergers than for horizontal mergers. For the study period, 1979-2002, stock market returns attributable to merger activity amounted to 4.7% for horizontal mergers, 0.9% for mixed horizontal and vertical mergers and 1.1% for vertical mergers. This pattern was consistent in both the earlier and later periods of the study. In fact, in the last six years of the study period, the vertical related merger returns were actually negative. However, this pattern is inconsistent with comparable results found by Fan and Goyal who found relatively small differences between returns for horizontal mergers, mixed horizontal and vertical mergers for the periods from 1980 to 1996.

For example, for the period 1991-96, Fan and Goyal identified stock market returns attributable to merger activity to be 3.1% for both pure horizontal mergers and mixed horizontal and vertical mergers and 2.6% for vertical mergers. Fan and Goyal's study was conducted before 1996-2002 input-output tables were available. Kedia et al analyzed the difference between their results and those of Fan and Goyal. They found significant differences in returns prior to 1996 and deals announced after 1996. They noted a decline in returns for all types of mergers after 1996 with a significantly greater decline in the performance of vertical mergers. The average return to vertical deals was about 2.8% before 1996 and -0.9% after that. In contrast the returns to horizontal deals was positive and significant (although declining) in both sub-periods. Kedia et al suggested that the lower returns to vertical deals after 1996 may be attributable to such mergers not being motivated by fundamental forces in the industry that favored vertical integration.

Table 2 also shows that the gains are largely associated with abnormal increases in the stock price of the target firm. This result is found in virtually all merger valuation studies.

Table 2 – Total Returns
Cumulative abnormal returns over the (–1, +1) day window using CRSP value-weighted index

Period	Vertical (V)	Horizontal (H)	Mixed (H,V)	Conglomerate
1979—1996	0.028	0.063	0.036	0.02
1996 – 2002	-0.009	0.023	-0.014	0.017
All	**0.011**	**0.047**	**0.009**	**0.019**
Acquirer Returns				
1979 –1996	0.001	0.04	0.015	-0.0009
1996 – 2002	-0.035	-0.14	-0.049	-0.003
All	-0.016	0.019	-0.019	-0.007
Target Returns				
1979 –1996	0.201	0.213	0.166	0.188
1996 – 2002	0.215	0.202	0.226	0.251
All	0.207	0.209	0.198	0.21

Theory of Vertical Mergers and Previous Studies of Input Foreclosure

The motives for a vertical merger are not usually attributable to enhancement of market power but instead arise because of production efficiencies. In his widely acclaimed 1937 article, Nature of the Firm article, Ronald Coase pointed out that the boundaries of a firm depend upon whether transactions between internal or external sources required for production are least costly. Vertical mergers substitute an internal transfer for a market transaction between separate entities and should lead to substantial economic efficiencies. Why do antitrust agencies believe that anticompetitive harm from such a transaction is possible and on occasion needs to be reviewed?

In the past 20 years an extensive literature has developed which describes the circumstances by which a vertically integrated firm has incentives to engage in harmful anticompetitive activities (Salop and Scheffman, 1987, Economides and Salop, 1998, Riordan, 2008 and Normann, 2009). According to the theory of input foreclosure, after the merger the vertically integrated firm can raise its rival's costs in three ways:

(1) a reduction in the quality of needed upstream inputs
(2) a refusal to provide inputs
(3) a relative increase in the price of access of needed inputs for which there are no close substitutes

Firms generally face a trade-off: they lose profits by foreclosing inputs in the upstream market, and have to weigh this loss against possible long-run profit gains from expanding sales and raising prices in the downstream market.

LaFontaine and Slater (2007) did an extensive review of the empirical literature pertaining to vertical mergers. Researchers have devoted considerable attention to testing whether vertical mergers give rise to input foreclosure. Industries that have been examined tend to be those that have received the most reviews from regulators; for example, cement and concrete, cable TV programming and distribution, and oil refining and distribution. Some of the studies focused on the likelihood of vertically integrated firms to exclude the products of non-integrated rivals (e.g., rival programs in the case of cable TV), others assessed whether non-integrated rivals pay higher prices for the upstream product (e.g., wholesale prices for gasoline), whereas still others evaluated stock–market reactions to vertical–merger announcements (e.g., changes in returns to holding shares in either rival or downstream consumer firms). Some authors have uncovered evidence of foreclosure. In our recent paper, Kahn and Kahn (forthcoming 2011) we uncovered evidence of foreclosure in the domestic airline industry.

In Salinger's (1988) model he showed that two countervailing factors associated with vertical mergers must be balanced. A cost benefit analysis must be conducted whereby an increase in input foreclosure or other practices that disadvantage rivals (costs) must be compared to a lessening of double marginalization or other practices that are inefficient (benefits). LaFontaine and Slater reviewed two studies, Mullin (1997) and Chipty (2001), which attempted to assess this key tradeoff . and both studies concluded that efficiency benefits outweighed input foreclosure costs. The evidence in favor of anti-competitive input foreclosure is therefore, at best weak, particularly when one considers that the industries studied were handpicked to find just such a result. Recently the Federal Communications Commission (FCC, 2011) reached a different conclusion in the agency's antitrust review of the merger of Comcast and NBC, finding that anticompetitive harms outweighed efficiency gains.

FCC Antitrust Review of Costs and Benefits of the Merger of Comcast and NBC

In December 2009 Comcast and GE (the owner of NBC) announced their desire to strike a 30 billion dollar deal by which Comcast would own 51% of NBC. The proposed deal quickly resulted in a lengthy regulatory review by the DOJ and the FCC which was finally resolved by January 2011 decisions by these agencies to permit the merger subject to remedial conditions being imposed to address anti-competitive harms.

At the core of the dispute were the contrasting views between economists about whether this merger would result in irreparable harm to consumer welfare or not. Economists Katz and Israel (2010) representing Comcast, pointed out that substantial transaction cost efficiencies would result from the proposed merger. They emphasized that the internalization of double marginalization would result in an important potential efficiency associated with any vertical transaction where there is market power both up and downstream pre-merger. Rogerson (2010), the economist representing the American Cable Association (ACA), a trade association of Comcast's downstream rivals, AT&T, Verizon, DirecTV, Dish and others, noted that input foreclosure would harm consumers by a substantial amount and that the magnitude of the double marginalization efficiency had been misrepresented by Katz and Israel.

The Double Marginalization Benefit Analysis of the Parties and the FCC Conclusion

In order to understand how the cost benefit analysis was conducted by the FCC in their antitrust review, a brief description of the current industry structure is needed. Comcast operates in the downstream multichannel video programming distributor (MVPD) market. NBC operates only in the upstream multichannel video programming industry and is a major participant in this industry. Its most significant programming assets consist of ten NBC owned and operated (O&O) local broadcast television and various popular national cable networks such as USA, Bravo, Oxygen, MSNBC. Comcast also operates in the upstream programming market through its ownership of nine regional sports networks. In the downstream MVPD industry, Comcast is the largest cable operator in the country, servicing 23.8 million customers in 39 states. Comcast and NBC each possess significant amounts of market power in their respective markets.

In economic studies presented to the FCC by Comcast and ACA, both sides assumed that the value of the NBC content was equal to $1.56 monthly per subscriber before the merger. Katz and Israel, observed that Comcast's marginal cost of providing cable service would be reduced by $1.56 per subscriber per month after the merger because the payment of $1.56 per subscriber per month for NBC's national cable networks would now simply be a transfer payment between divisions. Also Comcast would receive $1.56 per subscriber per month in advertising revenues from NBC's national cable networks. The true marginal cost of offering NBC programming to Comcast subscribers would be reduced to zero. In recognition of this economic efficiency, described as the elimination of double marginalization in the vertical integration literature, Katz and Israel argued that Comcast would pass through some of this cost reduction to its subscribers in the form of lower subscription prices. This efficiency benefit resulting from the merger must be weighed against any competitive harms of the merger that could result from possible programming cost increases for other MVPDs due to increased market power of the merged firm.

In presenting the case for the ACA, Rogerson (2010, p19) argued that the basic error in the Comcast analysis is that it ignored a new opportunity cost that Comcast ought to take into account after the transaction. The new opportunity cost is created because the joint venture charges $1.56 per subscriber per month not only to Comcast but also to all MVPDs that compete with Comcast. Furthermore, since the marginal cost to the joint venture of providing this programming to an additional viewer is essentially zero, this entire fee of $1.56 per subscriber per month from other MVPDs represents profit to the joint venture. Rogerson posited the following hypothetical: "Now suppose that Comcast lowers its subscription price slightly in an attempt to attract more customers. The critical point to recognize (which is the point that Drs. Israel and Katz fail recognize in their analysis) is that to the extent that these new customers are customers that switch from some other MVPD, this will cause the joint venture to lose $1.56 per subscriber per month in programming profit. In particular, if 100% of the customers that Comcast would attract are customers that would switch from some other MVPD, then the opportunity

cost of attracting new customers is exactly equal to $1.56. This is because, when Comcast attracts a new customer, it loses a profit of $1.56 on sales of NBC programming to the MVPD that the customer switches from." According to Rogerson the correct formula for estimating the reduction in Comcast's marginal cost due to the double marginalization benefit is

$$\Delta C = (1-\theta)(f + a) \tag{1}$$

where ΔC denotes the reduction in Comcast's costs due to the double marginalization benefit, f is the fee that Comcast pays for the NBCU national cable networks, a is the advertising revenue that NBCU earns on its national cable networks, and θ is the answer to the following question:. Suppose that Comcast were to lower the price of expanded basic by a small amount in order to try and attract new customers. What fraction of the newly arriving customers would be customers that switch from the expanded basic service offered by a rival MVPD?' Given that the share of TV households that do not subscribe to any MVPD service or that subscribe only to limited basic MVPD service is both very small and stable, it seems very likely that θ is extremely close to 1. If θ is extremely close to one as Rogerson posited, the double marginalization benefit evaporates.

After reviewing the evidence, the FCC concluded that Comcast's subscribers benefit from the elimination of double marginalization, but those benefits are likely substantially lower than the amount claimed by Comcast economists.

The Competitive Harms Cost Analysis of the Parties and the FCC Conclusion

In a detailed technical appendix the FCC described several economic analyses which it relied upon to evaluate the potential harms from the proposed joint venture between Comcast and NBC. The FCC evaluated the likelihood of various strategies that Comcast could adopt to harm MVPD competition. These strategies included: (1) temporary and/or permanent input foreclosure through denial of programming to rival MVPDs and other distributors; and (2) higher programming fees to rival MVPDs. The FCC concluded that the proposed merger would provide Comcast with an increased incentive and ability to engage in anticompetitive conduct to disadvantage rivals and harm consumers if remedial conditions were not imposed.

FCC Input Foreclosure Analysis

In its input foreclosure analysis, the FCC sought to determine whether foreclosure would be profitable for Comcast. Costs and benefits from input foreclosure were calculated for permanent foreclosure under various assumptions. The FCC determined that the costs to Comcast of input foreclosure result if the vertically integrated firm withholds the NBC broadcast signal from a rival MVPD, thereby losing advertising revenues and retransmission consent fees from those consumers that remain with the rival MVPD but no longer watch the NBC station. Since the signal remains available over the air, some fraction of the rival MVPD's viewers will continue to watch NBC broadcast programming and advertising, thereby reducing the economic loss suffered by the integrated firm. The cost is therefore:

$$Costs = (1-d)\times Subs \times Fee + (1-d-a)\times Subs \times Ad \tag{2}$$

In this expression, d is the fraction of the rival MVPD's subscribers that switch to an alternative MVPD that still carries the broadcast signal, a is the fraction of viewers who remain with the MVPD but obtain the broadcast signal over the air, Subs is the number of customers subscribing to the rival MVPD, *Ad* and *Fee*, are the per subscriber net advertising revenues and retransmission fees, respectively. Accordingly, the product $(1 - d - a) \times$ Subs is an expression for the number of rival firm subscribers that remain with that firm and forego watching the NBC broadcast signal. This quantity is then multiplied by per subscriber advertising revenues to generate the total loss in advertising. Since Comcast-NBCU will not collect retransmission consent fees on the fraction a of subscribers that continue to watch NBC over the air, $(1-d) \times Subs \times Fee$ is the loss in retransmission consent fee revenues due to foreclosure.

The integrated firm stands to gain the video distribution profits from customers who switch from the rival MVPD to the Comcast distribution platform. The FCC determined that the benefits to Comcast of input foreclosure are determined by identifying the number of subscribers that choose to switch to Comcast due to the programming loss on the rival distribution platform multiplied by Comcast's monthly per subscriber profit margin for customers subscribing to video services. The FCC uses the following methodology to determine benefits: the number of new subscribers is given by the expression $\alpha \times d \times Subs$, where d is again the fraction of rival subscribers who depart for another MVPD, and α is the fraction of these subscribers that choose Comcast. The fraction d will be referred to throughout the analysis as the "departure rate," and the fraction α will be referred to as the "diversion rate." The profit per new subscriber (π) consists of revenues generated from the additional subscription fees and advertising that accrue to Comcast in its capacity as a video, broadband and telephony distributor, less the variable costs of serving these new subscribers, divided by the number of new subscribers. Assuming that retransmission consent fees do not vary by MVPD and letting s be the share of the incremental profits that accrue to the vertically integrated firm, with the remainder accruing to its joint venture partner (*i.e.* GE), the benefits of foreclosure are:

$$Benefits = s \times (\alpha \times d \times Subs \tag{3}$$

The model assumes that customers who switch never return to the foreclosed MVPD; the costs and benefits are the same.

From the above cost and benefit expressions, the FCC than generated a threshold for whether or not a foreclosure strategy will be profitable for the integrated firm. This "critical value" is obtained by equating the costs and benefits of foreclosure and solving algebraically for d. This value, denoted by d^*, is the fraction of rival MVPD subscribers that must switch to Comcast in order for the upstream joint venture profit losses to equal the downstream profit gains. If the expected fraction of customers departing the rival firm is greater than this critical value, then foreclosure would be expected to be profitable, otherwise it would not. For the permanent foreclosure case, the critical value is given by:

$$d^* = \frac{(1-a) \times Ad + Fee}{s \times \alpha \times \pi + Ad + Fee} \tag{4}$$

The FCC estimated customer departure rates from an MVPD based on proprietary data filed by the parties to the proceeding. The FCC compared their proprietary estimates to actual customer departure rates following the temporary loss of a broadcast network resulting from a retransmission consent dispute between Fisher Communication and DISH Network. On December 17, 2008, Fisher suspended DISH's carriage of their local broadcast network affiliates in seven service areas in Oregon, Washington, Idaho and California due to a breakdown in negotiations over retransmission consent fees. One "big four" broadcast affiliate was lost in each market except for Bakersfield, which lost two affiliates so is excluded from the analysis. The dispute lasted approximately six months, until the affiliate signals were restored on June 10, 2009. The FCC concluded that the comparison of the actual departure rate estimated from the DISH data with the critical values for the foreclosure models developed by the FCC for the Comcast NBC review demonstrates that Comcast would almost always profit by either temporarily or permanently withholding coverage of NBC broadcast stations from MVPD rivals.

FCC Price Increase Analysis

In its price increase analysis, the FCC noted that standard bargaining theory predicts that a firm will obtain a higher price through bargaining if its best alternative to a negotiated agreement (BATNA) improves or the other party's BATNA worsens. In this case, vertical integration of NBC's programming and Comcast distribution assets would improve the bargaining position of the integrated firm when negotiating the sale of programming to one of Comcast's video distribution rivals because failure to reach an agreement means that some of the rival's subscribers will shift to Comcast, thus improving the integrated firm's best alternative to reach an agreement relative to Comcast's postion prior to the NBC merger. As a result, the integrated firm improves its bargaining position, allowing it to extract higher prices from rival MVPDs than pre-transaction NBC was able to when negotiating with Comcast's distribution rivals.

The post-transaction increase in opportunity cost to the integrated firm of providing NBC programming to one of its MVPD rivals is given by the product $d \times \alpha \times \pi$, where, d is the departure rate from the rival MVPD if Comcast withholds programming, α is the diversion rate of these subscribers to Comcast's cable system and π is the per subscriber MVPD profits of Comcast. In the Nash bargaining framework, the increase in opportunity cost improves the integrated firm's BATNA, leading to an increase in the price that firm negotiates when selling NBC content to Comcast's video distribution rivals. In particular, under the Nash bargaining solution, the fraction $(1-\mu)$ of the cost increase is transferred through to the negotiated price, where $(1-\mu)$ is the bargaining skill or relative patience of the rival MVPD. This implies that an estimate of the increase in programming prices resulting from vertical integration is given by the following expression:

$$\Delta P = (1-\mu) \times d \times \alpha \times \pi \tag{5}$$

By using a bargaining model that the FCC developed in a previous antitrust review of a merger between News Corporation (FOX Entertainment Group) and Hughes Electronics Corporation (DirecTV), the FCC compared price increase estimates from the bargaining model to the actual price increases for programming content paid by DISH, Comcast and Cox for News Corp. programming subsequent to the approved merger. Based on this comparison, the FCC determined that the evidence from this past vertical transaction supported their conclusion that vertically integrating a video distributor and a national cable programmer would lead to higher programming prices to rival MVPDs after a Comcast NBC merger.

## FCC Remedial Conditions to Avert Anti-competitive Harms

In order to prevent anti-competitive harms anticipated as a result of this merger, the FCC (2011, pgs 21-25) concluded that "post-transaction Comcast will have the ability as well as the incentive to employ program access strategies to exclude all its MVPD rivals in every franchise area market, by raising prices in all markets or withholding programming in at least some. As a consequence, without conditions, the transaction would likely harm competition in every such market. Our conclusion is also supported by Comcast's past behavior in foreclosing competing MVPDs from accessing certain programs… our program access rules, which address discriminatory pricing, inadequately address the potential harms presented by the increased ability and incentive of Comcast-NBCU to uniformly raise Comcast's rivals' fees…To address this concern in prior transactions, the Commission has imposed baseball-style arbitration to maintain the pre-integration balance of bargaining power between vertically integrated programming networks and rival MVPDs. We do so here, with

modifications. We establish in Appendix A a mechanism whereby an aggrieved MVPD may choose to submit a dispute with Comcast-NBCU over the terms and conditions of carriage of Comcast-NBCU affiliated programming to commercial arbitration. As in prior transactions, the arbitrator is directed to pick between the final contract offers submitted by Comcast-NBCU and the complainant MVPD based on which offer best reflects the fair market value of the programming at issue. This neutral dispute resolution forum will prevent Comcast-NBCU from exercising its increased market power to force Comcast's MVPD rivals to accept either inordinate fee increases for access to affiliated programming or other unwanted programming concessions, and will effectively address price increase strategies that could otherwise be used to circumvent our program access rules…Our arbitration condition is intended to push the parties towards agreement prior to a breakdown in negotiations. Final offer arbitration has the attractive 'ability to induce two sides to reach their own agreement, lest they risk the possibility that a relatively extreme offer of the other side may be selected by the arbitrator.' We find that the availability of an arbitration remedy supports market forces and helps prevent this transaction from distorting the markets."

Can Baseball Style Arbitration Avert Anti-competitive Harms?

Adopted in 1973, baseball salary arbitration was a compromise offered by the owners to end lengthy legal wrangling caused by the lack of player bargaining power due to the "reserve clause" in MLB player contracts, which had enabled clubs to renew player contracts each year in perpetuity. The reserve clause banned players from negotiating with other teams thereby preventing the development of a free market for a player's services. As a result of this hands-off policy, there could be no bidding war between teams which could drastically increase player salaries. The owners proposed the salary arbitration system in which individual salary disputes between the players and owners could be submitted to a neutral arbitrator. The owners thought the arbitration process would eliminate players' holding out for higher salaries. In their critique of baseball style arbitration, Ham and Malach (2010, pgs 72-73) quote from Marvin Miller, a former economist for the United Steelworkers of America, who was chosen in 1966 to head the Players Association, regarding this compromise solution "(T)he difference between a ballplayer's being required to accept whatever a club offered him, as had been the case almost from the beginning of professional baseball, and the new system of salary arbitration was like the difference between dictatorship and democracy. Salary arbitration has been a major factor in eliminating gross inequities in the salary structures from club to club (and sometimes on the same club) and, along with the right of free agency, negotiated three years later, produced the most rapid growth of salaries ever experienced in any industry. "

Baseball-style arbitration has indeed changed the dynamics of the bargaining process and has resulted in significant salary increases for the player who had little bargaining power prior to its introduction in 1973. From 1979 to 1996, average arbitration awards rose from $68,000 to $2,300,000, a compound average growth rate of 23%. In the following graph, developed by D. Studeman (2005), we see the rapid increase in salaries after arbitration was permitted.
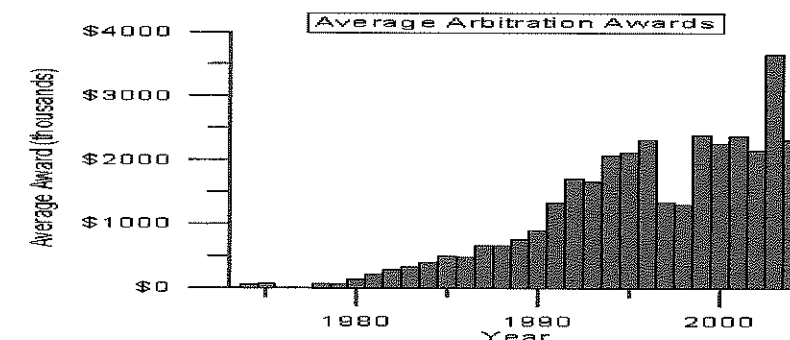
It remains to be seen whether baseball style arbitration will substantively halter the dynamics of the bargaining process in the cable television industry post merger, as the FCC hopes.

Conclusion

In this paper, I have explained how new views about the need to carefully review vertical mergers have developed in the U.S. In addition, I have provided empirical reviews of industry-specific studies of vertical mergers in which input foreclosure was postulated. Finally, I have described how the FCC evaluated the Comcast-NBC merger which was finally approved by the Department of Justice and the FCC. An important insight was provided by Michael Salinger (2005), of one of the more illustrious researchers in the vertical integration field, when he was then Chief Economist for the Federal Trade

Commission. Salinger asked: "What are we to do when we have a model that says that some but not all vertical mergers are harmful, but the model is formulated in such a way that it is hard to match it to the factual setting of a particular case in a way that would stand up to cross-examination?... Do such models form the foundation of a valid basis for challenging vertical mergers? " In response to Salinger's question, in its review of the Comcast NBC merger, the FCC provided a cost benefit model by which the FCC determined costs of input foreclosure for Comcast's rivals trumped the efficiency benefits of the elimination of double marginalization between Comcast and NBC. As a result of this finding, the FCC applied remedial conditions on Comcast and NBC that mandated contentious issues between Comcast and its rivals would be resolved through baseball style arbitration.

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An Exploratory Study of Differences in Students' Views of the Market System

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Abstract

This study examines data gathered in an anonymous in-class survey of first-year university students regarding the perception of markets. The study employs a survey instrument developed by Lephardt and Breeden (2005) and investigates the existence of differences in the perception of the role of markets along gender lines and by major field of study. Although male students generally had a more favorable impression of markets, only token statistical evidence was found for the existence of these differences. This study found differences in the perception of markets to be somewhat striking.

The Survey Instrument and Associated Material

This study uses the Market Attitude Inventory (MAI) survey instrument developed by Breeden and Lephardt (2002) and Lephardt and Breeden (2005). The 2002 paper was an empirical study that used a survey instrument first developed by the authors in 1992 and refined over the next decade. The 2002 study involved 406 student responses in three different economics courses during two time periods (1992 and 1999). The authors found "significant differences in attitudes between demographic subcategories and between classes of students, as well as changes in attitudes over the time elapsed" (Breeden and Lephardt 2002, p. 154). The 2005 study provides the development and underpinnings of the survey instrument used in the 2002 paper. In many ways, the methodology set forth in the Lephardt and Breeden study of 2005 preceded the 2002 study. The authors noted two factors that motivated them to develop the MAI. One factor was a long-term research agenda involving "the evaluation of the relationship between an individual's attitudes toward the market system and achievement of economic success within that system" (Lephardt and Breeden 2005, p. 63). The second factor was the absence of any valid survey instrument "that measured the values and attitudes people hold toward the market system" (Lephardt and Breeden 2005, p. 63).

The survey instrument has two sections. The first section of the survey requested demographic data from the individual respondent. Specific questions pertained to the respondent's gender, age, ethnicity, and major field of study.

The second section of the survey instrument was a slightly modified version of the MAI developed by Lephardt and Breeden (2005). The original MAI had 22 statements that measured attitudes towards the market system. Some of the statements portray a positive slant towards a market economy and some portray a negative slant towards a market economy (Thomas and Campbell 2006, 33). The 22 statements in the MAI are prefaced with the clause "In my opinion, the market system in the U.S. ..." (Lephardt and Breeden 2005, 68). Breeden and Lephardt found "students in more advanced business classes having the most pro-market attitudes" (Breeden and Lephardt 2002, 169). However, since this study focused on first-year students, and first-year students, with minimal exposure to either business or economics in the high school curriculum, might focus on the word "market" in the introductory clause and lose sight of the study's emphasis. Consequently, it was decided that the introductory clause be massaged to read "In my opinion, the economic system in the United States:" (emphasis added). The wording of the 22 statements, however, did not change from the original MAI. Five additional statements that relate to the role of the federal government in a market-based economy were introduced. Hence, the wording of the introductory clause to these five statements (23-27, inclusive) was revised to read "In my opinion, the federal government of the United States should:".

Survey Results

The expanded version of the MAI was administered anonymously during the second week of the semester to students in eight sections of a freshman-level course. The sections ranged in size from 18 to 25 students.

A total of 186 survey instruments were returned but one survey was discarded for incomplete responses. Of the 185 viable surveys, 84 were from young women and 101 returned from young men. Approximately 90 percent (164) of the respondents self-identified themselves as Caucasian while seven respondents self-identified themselves as African-American and seven more self-reported themselves as Hispanic (or Latino/Latina). Over 55 percent of the students (102) indicated they were planning to major in an area within the College of Business. For each of the 27 statements in the survey, a t-test for difference

between means was conducted along gender lines (that is, male and female) and by major field of study (specifically, Business and non-Business).

Examining Differences in Mean Responses by Gender

Breeden and Lephardt (2002) examined a number of sub-categories among the respondents. One of their findings is that male students tended to be more pro-market than females. King and King (2007) also used the MAI and found "females had less favorable views of free markets than males, although neither group reported particularly strong beliefs" (King and King 2007, p. 168). Table 1 allows for the examination of the mean responses along gender lines. In general, for the original 22 MAI statements, the mean responses by males were generally more favorable to the market than were the mean female responses. This was true for statements that held either a positive slant or a negative slant towards the role of markets. However, in only two of the original 22 MAI statements (19 and 21) is the difference in the mean responses statistically different at the ten percent level.

This study added five statements (23-27, inclusive) that pertained to the role of the federal government in the United States economy. For all five statements, the mean responses by males were more pro-market than were the mean responses for females. However, for only one of the five statements was the difference between the means found to be statistically significant at the ten percent level.

Examining Differences in Mean Responses by Major

Breeden and Lephardt found one of "the most notable subgroup categories was the Business Major comparison between the 1992 and 1999 sample" (Breeden and Lephardt 2002, 160). Breeden and Lephardt found nine of the differences in means to be statistically significant at the one percent level. Moreover, the authors found that in eight of those instances "the means indicate there is a pervasive decline in positive attitudes towards the market" (Breeden and Lephardt 2002, 160) among Business majors. Table 1 allows for the examination of the mean responses by major college of study (that is, Business and Non-Business). In general, for the original 22 MAI statements, the mean responses by Business majors were generally more favorable to the market than were the mean responses by Non-Business majors. This was true for statements that held either a positive slant or a negative slant towards the role of markets. For six of the original 22 MAI statements was the difference in the mean responses *statistically different* at the ten percent level. One interesting finding is that among the statements with statistically significant outcomes, four had a negative slant towards markets while two had a positive slant towards markets. Statements 1, 3, 7 and 11 have a negative slant towards the role of markets in the functioning of the economy. Specifically, Statement 1 pertained to promoting an unfair distribution of income, Statement 3 commented upon encouraging unethical business behavior, Statement 7 addressed greed and excessive materialism, and Statement 11 referenced the attempts by business to promote monopoly power. The two positive statements pertained to providing employment opportunities for all who desire to work (Statement 19) and encouraging innovation and the development of new businesses (Statement 20). None of the five statements that pertained to the role to the federal government were found to be statistically significant at even the 20 percent level.

Conclusions

The objective of this study was to investigate the existence of differences in the perception of markets along both gender lines and major field of study. This study found male students generally had a more favorable view of markets than female students but that this difference was not particular strong in a statistical framework. This study also found a pronounced difference in the perception of markets along major fields of study.

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Table 1
Response Summaries and Tests of Hypotheses

Situation/Scenario *In my opinion, the economic system in the United States:*	Cohort	Characteristics: mean	st. dev.	H₁: μx - μy ? 0 Pr > |t|
1. …leads to an unfair distribution of income.	**Overall**	**53.45**	**24.56**	
	Females	56.31	22.05	
	Males	51.07	26.34	0.149
	Business	48.75	23.70	
	Non-Bus	59.22	24.51	0.004
2. …rewards people fairly for their productivity and hard work.	**Overall**	**54.95**	**23.94**	
	Females	52.12	22.46	
	Males	57.30	24.97	0.143
	Business	56.18	24.10	
	Non-Bus	53.43	23.80	0.440
3. …encourages unethical business behavior.	**Overall**	**44.76**	**22.56**	
	Females	46.25	21.23	
	Males	43.51	23.65	0.413
	Business	41.27	23.26	
	Non-Bus	49.04	21.03	0.020
4. …leads to quality and technological advancement in products and services.	**Overall**	**74.34**	**18.14**	
	Females	73.21	19.32	
	Males	75.27	17.13	0.445
	Business	74.36	17.32	
	Non-Bus	74.30	19.20	0.982
5. …leads to inadequate amounts of important public services (like police, roads, fire prevention).	**Overall**	**44.46**	**21.70**	
	Females	44.43	21.82	
	Males	44.49	21.70	0.987
	Business	44.48	21.76	
	Non-Bus	44.43	21.76	0.988
6. …provides opportunities and incentives for success.	**Overall**	**71.25**	**21.58**	
	Females	70.17	20.09	
	Males	72.16	22.81	0.534
	Business	71.21	22.18	
	Non-Bus	71.31	20.96	0.973
7. …encourages greed and excessive materialism.	**Overall**	**67.11**	**24.15**	
	Females	65.50	25.63	
	Males	68.38	22.90	0.437
	Business	64.46	24.46	
	Non-Bus	70.57	23.50	0.098
8. …allows equal access to work opportunities.	**Overall**	**46.48**	**22.11**	
	Females	43.81	22.27	
	Males	48.70	21.83	0.134
	Business	47.37	21.85	
	Non-Bus	45.39	22.51	0.545

Table 1 (continued)
Response Summaries and Tests of Hypotheses

Situation/Scenario *In my opinion, the economic system in the U.S.:*	Cohort	Characteristics: mean	st. dev.	$H_1: \mu_x - \mu_y \; ? \; 0$ $Pr > \|t\|$
9. …leads to erratic cycles of growth and then decline in economic activity.	**Overall**	**59.77**	**20.92**	
	Females	60.12	22.05	
	Males	59.49	20.04	0.838
	Business	59.98	20.61	
	Non-Bus	59.52	21.42	0.882
10. …raises the living standard for most people.	**Overall**	**58.56**	**19.78**	
	Females	58.07	19.32	
	Males	58.96	20.24	0.665
	Business	58.87	18.53	
	Non-Bus	58.17	21.32	0.811
11. …leads to monopoly power among businesses.	**Overall**	**53.91**	**22.92**	
	Females	56.00	23.00	
	Males	52.18	22.83	0.260
	Business	50.25	22.49	
	Non-Bus	58.42	22.78	0.015
12. …leads to an efficient use of resources.	**Overall**	**44.64**	**22.79**	
	Females	45.33	22.21	
	Males	44.06	23.36	0.706
	Business	46.76	22.71	
	Non-Bus	42.01	22.76	0.160
13. …encourages the abuse of the environment.	**Overall**	**53.63**	**24.88**	
	Females	51.13	26.86	
	Males	55.70	23.03	0.214
	Business	51.75	23.68	
	Non-Bus	55.93	26.23	0.258
14. …leads to unemployment and worker insecurity.	**Overall**	**50.03**	**22.27**	
	Females	52.07	23.15	
	Males	48.34	21.49	0.257
	Business	48.21	21.66	
	Non-Bus	52.28	22.93	0.583
15. …leads to excessive risk of business failure.	**Overall**	**50.76**	**22.13**	
	Females	49.35	23.02	
	Males	51.93	21.41	0.434
	Business	50.15	23.36	
	Non-Bus	51.51	20.86	0.679
16. …requires a lot of government control to work well.	**Overall**	**46.04**	**25.41**	
	Females	45.44	23.91	
	Males	46.53	26.71	0.772
	Business	44.26	25.11	
	Non-Bus	48.22	25.77	0.294

Table 1 (continued)
Response Summaries and Tests of Hypotheses

Situation/Scenario *In my opinion, the economic system in the U.S.:*	Cohort	Characteristics: mean	st. dev.	$H_1: \mu_x - \mu_y \; ? \; 0$ $Pr > \|t\|$
17. …allows too much foreign competition.	**Overall**	**48.60**	**24.14**	
	Females	51.23	24.31	
	Males	46.42	23.74	0.178
	Business	48.26	24.90	
	Non-Bus	49.01	23.33	0.835
18. …provides consumers the goods and services they want.	**Overall**	**71.68**	**22.65**	
	Females	68.93	25.19	
	Males	73.96	20.15	0.133
	Business	71.18	23.91	
	Non-Bus	72.29	21.19	0.741
19. …provides employment opportunities for all who desire to work.	**Overall**	**50.76**	**27.21**	
	Females	46.26	27.03	
	Males	54.51	26.92	0.040
	Business	54.79	25.88	
	Non-Bus	45.81	28.11	0.025
20. …encourages innovation and the development of new businesses.	**Overall**	**65.24**	**22.08**	
	Females	63.20	22.07	
	Males	54.51	22.07	0.254
	Business	54.79	22.29	
	Non-Bus	45.81	21.53	0.074
21. …provide goods and services at an affordable price.	**Overall**	**54.64**	**21.03**	
	Females	51.19	22.81	
	Males	57.51	19.08	0.041
	Business	56.67	21.68	
	Non-Bus	52.16	20.05	0.147
22. *"Overall, I believe that the economic system in the United States is a fair and ethical system."*	**Overall**	**57.44**	**23.29**	
	Females	56.37	22.12	
	Males	58.33	24.30	0.107
	Business	59.31	22.11	
	Non-Bus	55.13	24.62	0.226

An Exploratory Study of Differences in Students' Views of Traditionally Female and Traditionally Male Occupations

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Abstract

This study examines data gathered in an anonymous in-class survey of first-year university students. The purpose of the study was two-fold. First, the study examines whether certain occupations could be identified as male-dominated, female-dominated, or gender balanced. This study found that male students and female students agreed on the ten most male-dominated occupations and were in agreement in eight of the ten most female-dominated occupations. These findings tend to support the view that, to a degree, occupational stereotypes are ingrained as part of the culture's general orientation. Second, this study also investigates whether a specific occupation was female-dominated or male-dominated. This study found statistically significant differences exist along gender lines for six of the 50 occupations.

Survey Instrument

The primary objective of this study is to examine whether young adults today perceive specific occupations as being male-dominated, female-dominated, or gender-balanced. A second goal of this study is to investigate whether a person's gender influences that person's perception of a specific occupation as being either male-dominated or female-dominated. It is the author's contention that the perception of sexual stereotypes of occupations is an important issue to consider during advising and career counseling. This may be especially true during a student's first year of college.

To examine these issues, a four page survey instrument was developed and pilot-tested during the summer term with an introductory survey of economics course for non-economics, non-business majors. The survey instrument was revised prior to the fall term. The survey instrument was administered during the second week of the fall 2010 semester to students in four sections of a freshman-level "introduction to college life" course. The sections ranged in size from 20 to 25 students.

The survey instrument had four sections. The first section of the survey requested demographic data from the individual respondent. Specific questions pertained to the respondent's gender, age, ethnicity, declared major field of study, and country of birth. A total of 88 completed surveys were returned (25 females and 63 males). Approximately 78 percent of the respondents self-identified themselves as Caucasian and over 17 percent of the respondents self-identified themselves as African-American/Black. Sixty-six of the respondents (75 percent) indicated they had declared a major within the College of Business.

A second section of the survey listed 50 occupations and asked each student to indicate whether she/he perceived the occupation as being numerically dominated by either males or females. Specifically, the students were told that occupations could be described as "male-dominated," "female-dominated," or "gender-balanced" on the basis of the proportion in which men and women are perceived to be employed in that occupation. For example, an occupation in which the number of women is much greater than that of men would be termed a "female-dominated" occupation; an occupation in which the number of women and men is approximately the same would be termed "gender balanced." Since the respondent was asked to indicate whether the occupation was either "female-dominated" or "male-dominated" and the percentage, all responses were converted into a percentage of males in an occupation to facilitate analysis.

A third section of the survey presented ten scenarios that briefly described either a man/husband or a woman/wife in different occupational or home situations. The respondents were asked to indicate their level of agreement with each statement by writing a number between "0" and "100" in a blank to the left of the statement, with a score of "0" indicating the respondent "strongly disagreed" with the statement and "100" indicating "strong agreement" with the statement. The purpose of these scenarios was to assess the respondent's perception of traditional gender roles in the workplace and the home.

A fourth section of the survey posed two types of questions. First, the respondent was asked whether he/she expressed a preference for either a male boss or a female boss. Second, the student was asked whether he/she expressed a preference for either a male or a female in different professional settings (for example, when choosing a dentist, choosing an automotive mechanic, choosing a hair stylist). The student respondent was asked to indicate his/her preference intensity to the situation by indicating on a continuum whether he/she "strongly preferred a male" ("0") to "strongly preferred a female" ("100").

Survey Results

Students were asked to respond with his/her impression of the proportion of men and women employed in 50 specific occupations. Table 1 presents the mean response scores for both females and males. The smaller the mean response, the more female-dominated the occupation is perceived to be; while the larger the mean response, the more male-dominated is the occupation perceived to be. A striking finding is the extent of agreement between the female and male respondents as to the dominated occupations. For both female and male respondents, the ten occupations that were perceived to have the most females were the same. Male and female respondents agreed on eight of the ten occupations that were perceived to be most male-dominated. The frequency of underestimation and overestimation for the 50 occupations was divided relatively evenly by gender. In addition to presenting the mean response scores for both females and males, Table 1 also presents the probability that the difference of the female and male means was equal to zero for each occupation. Six of the 50 female-male differences in Table 1 were found to be statistically significant at less than the ten percent level.

Although 75 percent of the respondents had declared a major within the College of Business, the data were also partitioned into both "Business majors" and "non-Business majors" and an analysis similar to the differences between male and female respondents in Table 1 was conducted. These results are reported in Table 2. For nine of the 50 occupations, the mean differences between Business and non-Business majors were found to be statistically significant at less than the ten percent level. Moreover, for both Business and non-Business majors, the ten most female-dominated occupations were the same and nine of the ten most male-dominated occupations were observed to be the same.

The third section of the survey instrument asked the respondent the degree to which he/she agreed (or disagreed) with each of ten statements as to the role of gender in society. The less agreement the respondent had with the statement, the lower the value. Table 3 lists the ten scenarios, the mean responses for both females and males, as well as a test of the difference between the female and male mean responses. A gender difference was found to be statistically significant at less than the six percent level for seven of the ten statements.

Table 4 lists 13 professional settings and provides both the mean response for both females and males and a test of the difference between the female and male responses. In this table, the smaller the response to the scenario, the stronger was the preference for a male in the scenario and the larger the response, the stronger the preference for a female in the scenario. A response in the neighborhood of "50" would indicate the "politically correct" response of a lack of either preference. For seven of the 13 scenarios portrayed, a gender difference in the responses was found to be statistically significant at the ten percent level. Overall, however, the response values generally followed the "politically correct" interpretation. A few exceptions should be noted. First, Item 7 of Table 4 states: "If I was taking a new job and had my choice of a boss I would …" Males expressed a statistically significant (at the nine percent level) preference for a male boss. Moreover, for Item 4 of Table 3 ("Most men prefer to work for a male boss."), the mean response of males was almost "75" which demonstrates a general agreement with the statement. Second, while females expressed a moderate preference for a female physician, males expressed a stronger preference for a male physician. Third, while both males and females indicated a strong preference for a female nurse (Item 3 in Table 4), males had a relatively strong preference for a male physician and females had a moderate preference for a female physician (Item 8 in Table 4). The gender preference for a physician is not surprising.

Conclusions

This study first examined whether certain occupations could be identified as male-dominated, female-dominated, or gender balanced. This study found that in a sample of first-year university students generally agreed upon which occupations were segregated by gender. Specifically, male students and female students agreed on the ten most male-dominated occupations and were in agreement in eight of the ten most female-dominated occupations. These findings tend to support the view that, to a degree, occupational stereotypes are ingrained as part of the culture's general orientation. This study also investigated whether a specific occupation was female-dominated or male-dominated. This study found statistically significant differences exist along gender lines for six of the 50 occupations. One immediate consequence of these findings is that the range of occupations male students and female students perceive as "open" to females is a bit narrow. This interpretation is supported in the study by the responses to two of the scenarios presented in Table 3. First, male students tended to be in general agreement with the statement "Occupations that have a larger percentage of men tend to be the more prestigious occupations." Second, women tended to be in agreement with the statement "Women have job opportunities equal to those of men."

The significance of these findings lies in the area of career counseling. The delivery of career information should be such that persons of both sexes should consider the full range of occupations that would satisfy their abilities and interests. This study also lays the foundation for a more comprehensive study of occupations along gender lines. In the fall of 2011, the author expects to extend the results of the study from one university to a number of universities across the country.

Table 1
Response Summaries of Males and Females in an Occupation and Tests of Gender Hypothesis $(H_1: \mu_f - \mu_m \ ? \ 0)$

Occupation	Females	Males	Pr > |t|	Occupation	Females	Males	Pr > |t|
1. Accountant	49.80	58.18	0.050	26. HS Math Teacher	56.20	53.02	0.365
2. Airline Flight Attendant	17.40	19.13	0.515	27. HS Physical Education Teacher	61.00	65.35	0.250
3. Airline Pilot	85.40	83.57	0.471	28. HS Science Teacher	55.20	51.67	0.298
4. Architect	76.60	77.02	0.913	29. Interior Decorator	22.60	21.98	0.863
5. Art Teacher	30.48	31.62	0.752	30. Lawyer	62.80	65.56	0.457
6. Athletic Trainer	64.80	63.14	0.662	31. Librarian	21.20	22.19	0.737
7. Automotive Mechanic	90.92	91.65	0.802	32. Mayor	76.40	74.69	0.638
8. Bank Teller	35.60	32.71	0.478	33. New Car Sales Person	71.36	78.78	0.064
9. Bus Driver	53.40	53.10	0.934	34. Nurse	25.60	22.10	0.317
10. Carpenter	88.60	87.37	0.603	35. Painter (House or Maintenance)	82.72	81.49	0.673
11. Chef (or Head Cook)	54.60	61.11	0.075	36. Pharmacist	49.80	46.84	0.422
12. Child (or Day) Care Worker	18.20	14.37	0.181	37. Physician (or Doctor)	59.60	62.30	0.381
13. Children's Physician/Doctor	48.00	48.60	0.874	38. Plumber	89.72	85.38	0.305
14. Construction Laborer	89.32	90.44	0.714	39. Preschool/Kinder. Teacher	18.64	21.67	0.440
15. Counter Attendant	48.40	47.62	0.736	40. Principal, Elementary School	56.16	53.29	0.427
16. Dental Assistant/Hygienist	22.60	25.49	0.477	41. Principal, HS	63.16	61.14	0.540
17. Dentist	69.80	70.56	0.867	42. Police Officer	73.80	70.64	0.429
18. Dietician	39.60	41.03	0.708	43. Restaurant Wait Staff	42.80	40.81	0.562
19. Electrician	87.00	84.18	0.430	44. Secretary/Administrative Asst.	21.40	22.21	0.805
20. Elem./Middle School Teacher	34.60	30.67	0.353	45. Special Education Teacher	32.40	35.87	0.380
21. Farmer	76.28	82.67	0.131	46. Television News Broadcaster	50.80	52.86	0.518
22. Fire Fighter	79.60	88.27	0.010	47. Television Sports Broadcaster	75.40	76.00	0.875
23. Florist	24.60	19.54	0.210	48. Television Weather Broadcaster	56.56	55.24	0.720
24. Hair Stylist/Cosmetologist	19.60	15.19	0.199	49. Veterinarian	52.40	42.30	0.011
25. HS Guidance Counselor	31.40	40.24	0.038	50. Veterinarian Assistant	29.60	31.46	0.603

Table 2
Response Summaries of Business and Non-Business Majors in an Occupation and Tests of "Major" Hypothesis $(H_1: \mu_{Bus} - \mu_{Non-Bus} \ ? \ 0)$

Occupation	Business	Non-Bus.	Pr > |t|	Occupation	Business	Non-Bus.	Pr > |t|
1. Accountant	58.33	48.18	0.022	26. HS Math Teacher	52.65	57.73	0.165
2. Airline Flight Attendant	18.41	19.32	0.742	27. HS Physical Education Teacher	62.76	68.18	0.168
3. Airline Pilot	83.41	86.14	0.301	28. HS Science Teacher	52.12	54.32	0.539
4. Architect	77.23	75.91	0.740	29. Interior Decorator	20.15	28.18	0.029
5. Art Teacher	31.96	29.32	0.482	30. Lawyer	64.26	66.32	0.594
6. Athletic Trainer	63.68	63.41	0.945	31. Librarian	21.20	24.05	0.353
7. Automotive Mechanic	90.65	93.82	0.296	32. Mayor	75.02	75.71	0.856
8. Bank Teller	35.17	28.64	0.121	33. New Car Sales Person	77.26	74.91	0.576
9. Bus Driver	53.86	51.14	0.477	34. Nurse	24.20	19.77	0.224
10. Carpenter	86.85	90.36	0.151	35. Painter (House or Maintenance)	80.41	86.14	0.672
11. Chef (or Head Cook)	60.46	55.68	0.213	36. Pharmacist	47.14	49.32	0.570
12. Child (or Day) Care Worker	16.11	13.50	0.384	37. Physician (or Doctor)	60.38	65.00	0.149
13. Children's Physician/Doctor	47.38	51.59	0.286	38. Plumber	86.77	86.14	0.886
14. Construction Laborer	89.26	92.73	0.276	39. Preschool/Kinder. Teacher	22.96	14.36	0.033
15. Counter Attendant	48.56	45.68	0.230	40. Principal, Elementary School	53.20	56.82	0.336
16. Dental Assistant/Hygienist	26.21	20.05	0.144	41. Principal, HS	59.56	68.18	0.011
17. Dentist	68.94	74.55	0.231	42. Police Officer	70.38	75.00	0.267
18. Dietician	40.83	40.00	0.835	43. Restaurant Wait Staff	42.76	37.23	0.120
19. Electrician	83.03	90.82	0.035	44. Secretary/Administrative Asst.	23.62	17.05	0.050
20. Elem./Middle School Teacher	30.56	35.46	0.267	45. Special Education Teacher	37.35	27.50	0.015
21. Farmer	81.44	79.09	0.596	46. Television News Broadcaster	52.27	52.27	1.000
22. Fire Fighter	86.94	82.41	0.205	47. Television Sports Broadcaster	74.74	79.09	0.270
23. Florist	20.89	21.23	0.937	48. Television Weather Broadcaster	53.24	62.73	0.012
24. Hair Stylist/Cosmetologist	15.29	19.91	0.197	49. Veterinarian	44.02	48.64	0.271
25. HS Guidance Counselor	39.77	31.59	0.066	50. Veterinarian Assistant	31.92	27.95	0.285

Table 3
Scenarios, Responses (by Gender) and Tests of Gender Hypothesis (H₁: μ_f - μ_m ? 0)

Scenario	Females	Males	Pr > |t|
1. When a wife works outside the home, a husband should share equally the cleaning and housekeeping responsibilities.	87.20	62.06	< 0.0001
2. A wife's place is in the home, not in the office or shop.	4.80	31.21	< 0.0001
3. Occupations that have a larger percentage of men tend to be the more prestigious occupations.	46.60	60.32	0.012
4. Most men prefer to work for a male boss.	69.40	73.49	0.384
5. A woman should be paid the same as a man for the same job.	99.60	85.24	0.001
6. It is better for the family if the man is the income earner outside the home and the woman takes care of the home and family.	33.60	54.76	0.001
7. Occupations that have a large percentage of men tend to have more career opportunities.	47.00	59.59	0.018
8. The employment of both parents is necessary to keep up with the high costs of living.	61.60	68.97	0.203
9. Most women prefer to work for a female boss.	46.08	54.37	0.068
10. Women have job opportunities equal to those of men.	53.20	49.92	0.557

Table 4
Occupational Setting, Responses (by Gender) and Tests of Gender Hypothesis (H₁: μ_f - μ_m ? 0)

Scenario	Females	Males	Pr > |t|
1. If I was choosing a **dentist** I would ...	42.60	45.73	0.471
2. If I was choosing a **lawyer** I would ...	41.60	31.86	0.080
3. If I was choosing a **nurse** I would ...	72.00	80.65	0.328
4. If I was choosing an **automotive mechanic** I would ...	18.00	10.92	0.151
5. If I was choosing a **librarian** I would ...	58.80	68.71	0.046
6. If I was choosing a **hairstylist** I would ...	72.28	69.11	0.683
7. If I was taking a new job and had my **choice of a boss** I would ...	42.20	34.84	0.089
8. If I was choosing a **doctor** (or **physician**) I would ...	58.20	37.90	0.001
9. If I was choosing a **dental hygienist** I would ...	52.80	58.39	0.217
10. If I was choosing a **police officer** I would ...	21.20	30.89	0.085
11. If I was choosing a **bank teller** I would ...	51.00	59.52	0.069
12. If I was choosing a **veterinarian** I would ...	52.00	61.15	0.018
13. If I was choosing a **counter attendant** (fast food, convenience store, and coffee shop) I would ...	49.00	58.05	0.034

The Race between the Dollar and the Euro: Who's on First?

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Abstract

The literature suggests that the global hegemony of the dollar may be waning while that of the euro is rising. However the Greek sovereign debt crisis that began in May 2010, and its possible spread to other euro using nations, calls the prediction into question. This paper ascertains the likelihood of such a currency switch occurring in the short to medium term via an analysis of data on five key features that support a vehicle currency's ubiquitous use. The conclusion drawn is that the greenback, while not facing any immediate loss of preeminence in the short run, will face a difficult struggle in the longer period as the euro band nations shore up their financial positions.

Introduction

Since the euro's creation in 1999 and pursuant to its use in currently seventeen nations throughout Europe, it has been suggested in the literature that the global financial hegemony of the dollar is waning while that of the new currency is waxing. For example a series of publications from the European Central Bank (ECB) in 2001, 2005, 2006 and 2009 point to the diminishing role of the greenback in global real and portfolio transactions in tandem with the concurrent rise of the euro's use. A similar conclusion has been drawn by the Bank of International Settlement's (BIS) analysis of foreign exchange being utilized in the world's derivative markets (Bank of International Settlements 2004 & 2007). Soon after the euro's total replacement of local currencies such as the deutsche mark and French franc in daily use by early 2002, DeGrauwe (2003) predicted that within a decade the majority share of cross border trade in both goods and in fiduciary instruments would be priced in this new global money thus eclipsing the dollar. While maintaining its hard currency classification, Karmin (2008) actually forecasted the decline of the dollar when relegating it to a second class status comparable to the one currently held by the British pound sterling. Even the *Economist* magazine hosted a series of articles deriding the dollar's preeminence that are too numerous to list from January 1999 through the start of 2010. While this list of greenback naysayers is by no means complete, it does posit a definite trend in both professional and popular publications by placing the further ubiquitous use of the U.S. currency in the global economy in a tenuous position. This replacement of the dollar with the euro culminated in Chinn and Frenkel's (2005; 2008) and Merkel's (2009 & 2010) prediction that as the dollar replaced the pound between the two world wars as the world's vehicle and reserve currency, so also will the euro be superseding America's money as such.

However, with the advent of the Greek sovereign debt crisis that began in May 2010 which was predicted to spread to other euro band nations such as Ireland, Italy, Spain and Portugal, this forecast of the dollar giving way to the euro may have been premature and perhaps based upon dubious opinions rather than solid facts. So the question arises: is the international role of the U.S. currency as the world's vehicle and reserve money truly changing to the detriment of the greenback? Indeed, as Cohen (1971) noted, the demise of the pound and the rising use of the dollar after 1918 did establish a precedent for such a transition in the global financial community. Thus the goal of this paper is to examine the likelihood of such a currency switch occurring again in the short to medium term.

Presented first will be an explanation of how the Greek debt debacle arose. The next section will question the pre-May 2010 predictions of the euro taking over the global hegemonic position of the dollar in the foreseeable future. The discussion will discredit any immediate threat to the dollar's dominance. The paper then concludes with the observation that the U.S. currency will face a difficult struggle to maintain its premier position.

The Greek Quagmire: From Whence and to Where

At the start of 2011 seventeen of the twenty-seven EU member nations use the euro. These include Austria, Belgium, Cyprus, Estonia, Finland, Germany, Greece, France, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. In order to ensure that a nation's economy was sound enough to join the potential euro-band, the convergence criteria outlined in the 1991 Maastricht Treaty (MT) requires that a country's government and financial market comply with five conditions prior to adopting the euro. These include stabilizing the exchange rate with those of the other EU nations currencies for a three year period (for those nations entering the EU after the euro's introduction in 1999 this means a stable exchange rate with the euro); reducing the domestic rate of inflation to less than 1.5% above the average rate of price increases of three nations with the lowest levels; reducing long term interest rates, normally interpreted as the ten year rate on national government bonds, to no more than 2% above the average of three nations having the lowest

percentages; reducing the national budget deficit to under 3% of GDP; and maintaining a national debt no larger than 60% of GDP. The goal was to introduce the new currency on January 1, 1997 within those nations meeting these conditions. However, most were unable do so and the initiation date was postponed.

Fruition was finally reached on January 1, 1999. Eleven of the seventeen nations listed above met the convergence requirements and adopted the euro. In 2001 Greece joined the euro band bringing the number up to twelve. Euro bank notes and coins came into circulation in January 2002. In 2004 Slovenia replaced its currency with the euro, and on January 1, 2008 it was also adopted by the small island nations of Cyprus and Malta. At the start of 2009 Slovakia joined the euro-band as did Estonia in January 2011.

By 2007 many of the above governments' budget deficit and debt levels, most notably those of Italy and France among others, exceeded the limits of the Maastricht criteria, albeit by relatively small margins which caused no major concern in Brussels. As reported in various issues of the *Economist,* by mid 2009 major violations of this pact were being reported by a large swath of euro using nations. The southern nations were the most culpable. For example Portugal's budget deficit exceeded 6.2% of GDP, more than twice the allowable figure, and Lisbon held a public debt of 77% of this figure. Spain's red ink topped 11.2% of annual production with its national debt creeping above the 60% of the GDP threshold. The budget deficit and public debt levels of Italy and Ireland also rose above the percentages accorded in the MT by between 8% and 17% of the allowable maxima. Strict adherence to the requirements of membership in the euro club was in general decline.

The volcanic eruption that began to rock euro land and cause international investors to question the stability of the new currency occurred in Greece. Initial rumblings were felt in mid-April 2010 when Athens had to push its ten year government bond rate more than 6% above that of the benchmark figure offered by Berlin, three times the limit allowed by the convergence criteria. In addition, the major rating agencies actually downgraded ten year Greek government bonds to junk status. This came on the heels of a publicized 9.4% of GDP deficit figure in tandem with a national debt in actual excess of total GDP by 1/10th. This dire announcement was compounded when the relatively new Greek government just coming off national elections further made public that the budget and debt figures its predecessor had been reporting to Brussels were not "entirely correct" and were being substantially revised. Quickly thereafter the governments of Spain, Portugal, Italy, and Ireland began offering ten year bonds 100 to 200 basis points above that of Germany. By May 5th, 2010 ten year Greek bonds were selling at above 10% per annum, Portugal at 5.9%, Ireland at 5.8%, and Spain and Italy at 4% (*Economist 2010, May 15).* Note that this was occurring when comparable U.S. Treasury issues were selling at less than 3.5%. Rumors of an impending Greek government default began to circulate.

The crisis became acute when the impact that a potential Greek sovereign debt cancellation, or even renegotiation, would have on investors in other EU nations and beyond, particularly banks still roiling from their own meltdown during 2008-9,. Per table 1, with an outstanding Greek government debt of E106 billion in Q4, 2009, E76 billion, or 72%, was owned by EU banks outside of Greece, with the remaining E30 billion in bank portfolios in the UK, in the U.S. and in other nations. French banks alone held E34, or almost 1/3rd of the total amount, and German ones operating in one of the world's most stable financial systems had an E20 billion exposure. The logical fear of contagion brought up nightmares of an international banking crisis being thrust on a still weakened global economy. Was 1929-1933 going to happen again?

On May 10th, 2010, fearing the global fallout of a Greek default, the finance ministers of all 27 EU nations met in Brussels and agreed upon a rescue package. A stabilization fund worth up to E500 billion would be offered to euro governments whose debt servicing is in jeopardy. This would be made available contingent upon the reduction of both the levels of budgetary deficits and the national debt pursuant to a plan and concurrent timeline for its implementation being approved. Included therein are E60 billion to be financed within 90 days by the sale of bonds. The ECB monetized a large percentage of this short term bailout money by immediately purchasing these euro bonds. In addition the IMF has committed E250 billion to supplement the stabilization fund if needed (*Economist* 2010, May 15).

Table 1: Foreign Banks Holdings of Greek Debt, Q 4, 2009. Billions of Euros

Country	% of total	Government Bonds	Total Debt
France	32	34	52
Germany	19	20	31
Netherlands	5	5	8
Rest of euro area	16	17	26
Total euro area	72	76	117
Britain	6	7	10
U.S.	7	8	12
Rest of world	15	16	25
Global total	100	106	164

Sources: BIS, www.bis.org; Economist, "The cracks and spread widen", May 1st, 2010.

Not surprisingly this has come with an investor stampede out of short term government issued euro paper and back into Treasury bills and notes notwithstanding U.S. interest rates at that time hovering slightly above 1/4th of 1% on 30 day instruments. This has been reinforced by the exchange rate turning against the euro not only on dollars but other hard currencies as well. Is this a harbinger of an imminent collapse of the euro currency as a potential replacement for the greenback and a return of the latter's secure hegemony? This study now turns to an analysis of the data on dollar usage throughout the global financial community leading up to the May 2010 period. The conclusions that will be drawn from the reported trends of greenback usage as an international currency, in exchange rate arrangements, in foreign reserve holdings, as an invoicing currency, and in cross-border financial transactions will belie the fear that the euro will supersede the dollar, at least in the short term. However, as will be discussed, the dollar could face intense competition after the euro band nations shore up their precarious financial situations and diligently adhere to the convergence criteria. Ironically, the dollar's demise will not stem from the strength of the euro per se but more from the overextended national debt position generated by massive U.S. government deficits as forecasted by the Congressional Budget Office.

Where the International Role of the Dollar Stands

The goal of this section is to provide empirical evidence that the U.S. dollar continues to retain its dominant position in international finance in five major categories. The data show that in at least the short run the greenback's extensive and intensive role in global finance appears secure. Thus the prospect that markets will soon make an abrupt shift to another currency, such as the euro, is problematic at best for international traders and financiers.

The first area examined is a twenty year trend of the dollar's usage as a, if not the, predominant form of cash currency both held and used around the world. In 2006 and in 2009 the U.S. Treasury reported that 65% of all U.S. banknotes are circulated outside of America. Specifically, about 75% of hundred dollar bills, 55% of fifty dollar bills, and 60% of the twenty dollar ones are held and used abroad. Thus in March, 2009, the latest data available, approximately $580 billion in actual currency was overseas. For Americans travelling abroad these figures should come as no great surprise. Many mundane transactions can be completed with dollars especially in developing nations whose local currency holds little prospect of stable purchasing power. In fact, some countries have officially adopted the greenback in lieu of its own money such as San Salvador and Ecuador, and many have done so *de facto* such as Zimbabwe.

Much of this expatriated money undoubtedly underpins illegal transactions from drug smuggling to bribery to arms sales. Hellerstein and Ryan (2009) point out the bulk of physical dollars appear to gravitate to Russia and its former U.S.S.R. states and to Latin America, all which attests to this likelihood. While the total percentage of U.S. currency held by foreigners has only risen slightly from 1990, its compositional changes further buttress the attraction. Hundred dollar bills held abroad rose from 65% to 75% of the total number between 1990 and 2009. In turn, the use of fifty dollar notes declined from 63% to 55% of the total number in existence and that of twenties from 73% to 60%. Benjamin Franklin is likely one of the globally best known American patriots.

The benefits to foreign holders of U.S. bills are substantial: a more stable store of value, especially in tandem with endemic hyper inflation of local currency (think of Zimbabwe recently with an inflation rate of more than one million percent per annum); and an improved medium of exchange function in that dollars are often preferred, even demanded, over home country bills in day to day transactions (Groen & Presenti 2009).

Note that in recent years the euro has enjoyed a growing role as global cash by circulating outside of the euro nation's borders. However, the ECB (2009) points out that in physical form euro notes are held primarily in nations contiguous, or at least in proximity, to the euro area. In addition, only about 15% of issued euro notes are estimated to be used outside of the 17 country euro band. Thus you are more likely to see euro bills used in Bulgaria than in South Africa, but you will see the dollar extensively exchange hands in both nations. Thus, U.S. currency still maintains its premier role as a global banknote.

The dollar also serves as an anchor currency in exchange rate arrangements for a large number of countries. In two successive studies Reinhart and Rogoff (2004) and Ilzetzki, Reinhart, and Rogoff (2008) report that of the 207 countries examined, seven have either officially dollarized (again Ecuador as an example) or have formed a currency board linked directly to the central bank's holding of dollars (such as Hong Kong and the Bahamas). In addition, 89 nations' monetary authorities have attached their currencies' exchange rate to the dollar in either a fixed or crawling peg manner (China is a notable example) and eight more maintain a managed float using the greenback as its reference currency. In fact from 1995 through 2007 the number of governments with a dollar peg increased by seven from 82 to the current 89 figure. During this time two additional central banks introduced a managed float hinged on America's currency, thereby increasing that number from six to eight. Thus, about half the world's currency, or 104 of 207 nations, today use some form of a dollar based exchange rate system. Note that the currencies tied to the greenback in the mid 1990s totaled 97. While issues have been raised regarding *de jure* versus *de facto* exchange rate regimes (IMF 2007), with this increase in the number of currencies aligned with the dollar in some manner since the creation of the euro, the dollar's position as an anchor is not only secure but

appears to be increasing. Lastly on this issue, only those EU nations in line to join the euro band and those anticipating EU membership, such as Croatia and Serbia, have elected to tie exchange rates with the euro. Even Turkey, while having been in prospective membership status limbo for years, has chosen to manage the float of the Turkish lira with the dollar.

A third indication of the greenback's hegemonic status is its prominence in governmental foreign exchange reserve accounts. From 1999 through 2009, foreign exchange reserves grew from about 1.8 trillion USD in total to slightly under seven trillion, or by more than three fold (IMF, 2010). Developing nations generated the majority of this growth. China alone accounts for close to 900 plus billion USD, much of it held in U.S. Treasuries and mortgage derivatives. As of the first quarter of 2010, the People's Bank of China (PBC) held almost 50% of the reserves of developing countries. Dollar assets currently comprise about two-thirds of the world's foreign exchange reserves. Note that with the onset of the euro in 1999, the currencies replaced by this new money, in particular the deutsche mark, French franc, and Italian lira, were logically no longer usable as foreign currency reserves per se and the dollar assumed a large percentage of this vacuum. As Adrian, et al (2009) point out, by pricing assets using the year 2000 constant exchange rate throughout the first decade of the 21st century, the dollar's share rose in the portfolios of industrialized nations, albeit moderately, and subsequently by a large percentage in that of the ones in the process of economic development.

Table 2: Turnover Percentages in Foreign Exchange Markets

Currency	1995*	2001	2007	2009
USD	83.3	90.3	86.3	89.8
Euro	53.7**	37.6	37.0	37.2
Yen	24.1	22.7	16.5	16.3
Other hard currencies***	24.2	33.9	40.5	36.6
Emerging market Currencies	8.5	16.9	19.8	20.2
Average daily turnover	1,150	1,420	1,970	3,520

Source: BIS.

*Note that the 1995 column does not add up to 200% due to the exclusion of many European currencies that were first to join the euro band such as the Italian lira, Belgian franc, and Spanish peseta

**These include the summation of the deutsche mark, French franc, Netherland guilder, and the European Currency Unit (predecessor to the euro). See * above.

***Included are the British pound, Swiss franc, Australian dollar, Canadian dollar, Swedish kroner, Norwegian kroner, New Zealand dollar, and Danish kroner.

Note that the sustainability of this role of the dollar has come under recent attack. In early 2010 Governor Shou of the PBC called for a shift away from the U.S. currency and into others, such as the yen and the euro. And prior to that announcement at a Group of Twenty finance ministerial meeting in April 2009 concern was raised over the growing U.S. federal deficit under Bush which has been exasperated by the phenomenal ones, both realized and projected, of Obama (U.S. Treasury 2010). Thus America cannot lie on its laurels and assume inertia in order to maintain its position as the world's reserve money, although any threat appears to be years away.

Between 1995 and 2009, the average daily foreign exchange turnover, i.e., the exchange of one currency for another, has tripled from 1,150 billion USD to 3,520 billion (Bank of International Settlements 2010). Noting that currency percentages will total to 200% pursuant to each transaction always requiring two currencies, table 2 lists the turnover rates in select years. With an almost USD 90% market share of foreign exchange transactions in 2009, i.e., with the dollar being bought/sold, the greenback continues to dominate the world's largest market at a rate held consistent throughout the decade of the euro. Granted the dollar is often used as an intermediate currency in an exchange between two less traded monies. For example, if a Moroccan importer needs Indian rupees to complete a transaction, dirhams will be exchanged for dollars which will then be exchanged for rupees; the likelihood of identifying a currency trader willing to negotiate a direct exchange between Moroccan and Indian currency is tenuous at best. As any basic textbook in International Finance will indicate (for example, see Madura 2010), this is due to the high bid-ask spread that would exist between the dirham and the rupee in juxtaposition to the lower ones that include the dollar. This minimizes potential transactions costs for currency traders which in turn buttresses the use of the dollar in such transactions.

The widespread use of invoicing in the USD currency in international trade reflects the dollar's dominance in foreign exchange. In a series of studies, Goldberg and Tille (2006; 2008; 2009) assess how prevalent the dollar is in international trade flows. These studies tabulate the use of the dollar in export pricing figures by twenty-four countries when trading with nations other than the U.S.A. These countries include OECD members such as France and Japan and developing nation such

as Thailand and Malaysia. By constructing a box diagram with exports to the USA as a percentage of total export volumes on the vertical axes and the dollar invoiced share of exports to nations outside of America on the horizontal one, these studies demonstrate that anywhere from about 35% of trade outflows from France to non-USA importing nations to above 90% exiting Malaysia to similar recipients are listed in USD figures. Note that this list excluded major oil exporters which would bias the results in favor of the dollar. While much of this may reflect exporter inertia in preferred currency use, the size and stability of the U.S. economy, long existing exchange rate ties of either, or both, the exporting and importing countries' currencies to the dollar, or simply choosing the invoicing currency used by most producers within an industry, the dollar remains a global best hedge against exchange rate and cost fluctuations that could abruptly turn against cross border traders.

Goldberg (2007) and Goldberg and Tille (2008 & 2009) do consider whether the creation of the euro has adversely impacted dollar invoicing volumes or percentages. They show that the euro is used almost ubiquitously throughout the EU and totally among the seventeen euro band nations which is no surprise. However, the euro is not broadly used as an invoicing anchor outside of the 27 EU countries and when it is used it functions as a back up to dollar values. The ECB in 2009 confirms this observation. At present the greenback will continue to hold sway over global pricing for goods and services crossing borders.

The last role of dollar to evaluate is that of its use in the international capital and money markets. The ECB (2009), Couerdacier and Martin (2007) and Thimann (2008), using Thompson Financial data, weigh the currency's status by measuring the share of outstanding debt securities that are denominated in dollars which are issued or held anywhere in the world. While enjoying a high of 42% in 1999, it is down by a small margin standing at 39% at the end of 2009 with the decline starting in 2003 after the euro totally replaced 12 European currencies. For debt issued in dollars by individuals, firms and governments outside of the USA in a currency other than that of the originating nations (referred to in a misnomer as euro dollar obligations), greenback denominations accounted for 48 % of global total. In particular, obligations issued in Latin America, the Middle East, Asia and the Pacific Rim (except Japan) are predominantly in dollars. Africa's debt is about evenly divided between dollars and euro, likely due to colonial ties to Europe. Only in Europe proper, from the U.K. to the border of Moldova, the Ukraine and Russia, is the bulk of debt denominated in the euro.

In addition the dollar continues to play a key role in the global foreign currency liabilities of commercial and central banks. According to the BIS (2010), these figures comprise bank debt to creditors in a foreign country and in a foreign currency. Barclay's Bank of London incurring a debt to Toyota of Japan in dollars or yen, or the Central Bank of Singapore borrowing dollars or pounds from the Central Bank of Canada, would provide mundane examples. The cross border foreign currency liability of non-U.S. banks has grown from a total of slightly under 6 trillion USD in 1999 to more than 16.2 trillion USD by the end of 2009. These numbers include both bank to bank obligations and bank to non-bank entities; the latter has registered the greatest rate of growth during this period although the former is about three times as large. As of the end of 2009, the USD share of this total was slightly below 60%, or 9.6 trillion.

Further evidence of the dollar's dominance among the world's banking institutions comes from the crisis that global banking faced under the credit crunch of 2008-9. When the overnight lending market evaporated, banks realized substantial but unobtainable dollar funding needs. The Fed successfully mitigated this dilemma by quickly establishing foreign exchange swap lines of credit with other central banks. This allowed non U.S. monetary authorities to make available USD to their local banks. The starting figure was 70 billion USD and by mid 2010 the Fed increased the amount contracted by central banks to over 560 billion USD. As late as May 2010 Dr. Bernake announced another extension of the swap line. Thus the volume and range of financial transactions noted by these dollar figures further attests that the greenback remains a, if not the, premier currency of choice.

Conclusion

The above data show that the global role of the dollar seems secure even a decade after the introduction and usage of the euro currency. Examined were figures regarding the greenback's usage as an international medium of exchange; its function as exchange rate anchor throughout more than 100 countries; the dollar's existence as foreign exchange reserves; its application in foreign exchange markets per se in tandem as a ubiquitous invoicing currency; and the role played in global financial transactions. The overarching conclusion that can be drawn is that the euro poses no immediate threat to the hegemonic dominance that the USD has held since WWII.

The euro is currently facing its first major crisis since the inception of the new currency in 1999. Pursuant to rising budget deficit and national debt levels now well above those proscribed in the Maastricht Treaty, the prospect of Greece defaulting on its' sovereign debt looms. For identical reasons the governments of Portugal, Spain, Ireland and Italy are facing the same dilemma. Note that banks throughout the euro using nations, French and German ones in particular, currently hold E76 billion of Greek government bonds which, via contagion, generate the fear of an EU wide financial collapse. For that matter U.S. banks, while less exposed, do hold E8 worth (*Economist,* May 1, 2010). A fund manager quoted in the May

22nd, 2010 article encapsulates the situation by stating (p. 76): "Many investors thought they were buying German bunds with a bit of free yield [from Greece and Italy]. Now they realize that they bought a lot more of the lira [and drachma] and a lot less of the deutsche mark than they thought". The prospect of another global financial quagmire seems real despite the massive E500 billion bailout proffered by Brussels in conjunction with another E250 billion coming from the IMF. Not surprisingly this has been reflected in the exchange rate turning against the euro not only in dollars but other hard currencies as well.

Is this a harbinger of an imminent halt of the euro currency becoming a potential replacement for the greenback and a return of the latter's secure hegemony? In the short run, probably yes. However, under the Obama bailout plan, according to Congressional Budget Office (2010) projections, America's budget deficit will average about 1 trillion USD per year through 2019. Add to that the future costs of the recently passed health care bill and the U.S. Treasury will see an aggregate national debt of more than 75% of GDP within a decade. Inevitably the global investor's taste for Treasuries will likely soon begin to wane (Baldacci et al 2010). Eichengreen (2011) further argues that the 2010 euro crisis has already set euro band nations on a course of inevitable fiscal consolidation. Thus, as the 17 euro band nations mitigate the current crisis by implementing stabilization fund outlays and the governments of Greece, Portugal, Spain, Ireland and Italy shore up their fiscal positions, the hot money presently flowing from euro instruments to dollar ones will reverse. By avoiding another financial disaster such as is seen today in the EU and by holding profligate governments culpable for adhering to the requirements of the Maastricht Treaty, the euro will likely resume its encroachment on the dollar in the medium term. If America rests on its historical economic laurels and continues on its present path to an astronomical level of national debt, the dollar will inexorably go the way of the pound sterling. After all, the potential insolvency of Greece and possibly that of Ireland, Spain, Portugal, and Italy precipitated the euro problem of 2010; America's prospect of continued profligacy may produce the same results for the dollar.

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Factors Affecting Employment in Major Sectors of South Carolina: An Empirical Investigation

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Abstract

This paper investigates the impact of business climate and quality of life variables on employment in major sectors of South Carolina. Five statistical models representing five major sectors of South Carolina (services, retail trade, manufacturing, state and local government, finance, insurance & real estate) are estimated. The results are mixed. Variables such as export, percentage of bachelor's degrees, capital investment, property tax, quality of life variables such as boat registration are important drivers of employment in major sectors of South Carolina economy. The results imply that the South Carolina development policy makers should promote export, improve quality of education and provide tax incentive to atract more businesses like BMW, Boing, and Amazon.Com.

Introduction

Historically, South Carolina had higher unemployment rates when compared to the average unemployment rates for the U.S. and those of other Southern States. In 1984 and 2009, while the national unemployment for the U.S. were 5.5 percent, and 9.5 percent respectively (Table 1), South Carolina's unemployment rates exceeded those of national averages at 6.7 percent and 11.7 percent respectively. In 2005, South Carolina had the third highest unemployment rate in the nation.

Table 1: Unemployment rate

	1984	1989	1999	2009
South Carolina	6.7	4.6	4.1	11.7
Georgia	6.1	5.3	3.8	9.6
Mississippi	10.8	8	5.3	9.6
Florida	6.6	5.7	4	10.5
North Carolina	6.8	3.6	3.3	10.6
U.S.	7.5	5.3	4.2	9.5

As South Carolina has entered the diversified era, the state has shifted away from manufacturing-intensive to service and trade sectors. Figures 1-3 in the Appendix 1 and Table 1 illustrate the changing pattern of South Carolina's employment base. The manufacturing contributions to employment declined from 22% in 1990 to 18% in 2000 and to 12% in 2009. Employment in service sector grew from 20% in 1990 to 23% in 2000 and to 28 in 2009.

The overall objective of this paper is to gain an understanding of the business climate, quality of life factors that influence the level and trend of employment in different sectors of South Carolina, which in turn can be useful for determining effective economic development strategy. To accomplish the objective, descriptive statistics and mulivariate regression are used. Using time series data of South Carolina for the period 1984 -2009, five statistical models are developed and estimated. The main hypothesis is that the level of employment in each sector is influenced by capital investment, export, government expenditures, gross state product, new business establishments, percentage holding bachelor degree, number of graduate, and per capita property tax rate, number of crime, number of vehicle registration, number of boat registration. The remainder of the paper is structured as follows: section 2 presents a brief literature review. Section 3 discusses methodology and data. Section 4 provides empirical results. Section 5 presents summary and conclusion.

Literature Review

The economic development literature on human capital formation generally suggests that improvements in the quality of life variables should positively impact development and employment prospects to the extent that the qualities of life variables help make labor more productive. A business climate and employment facts as well as a quality of life measures and an employment have a strong links and influence each other in a round way. Beyond this, growth and development should be

further enhanced if the improvements in the quality of life variables help to attract and thereby increase the availability of economic resources in the community.

Ideally, the quality of life could be gauged by focusing on factors such as health care, education, crime rate, the availability of affordable housing, and recreational outlets in the various counties of South Carolina. Researchers have offered an array of explanations for the mechanism of the employment associations with business climate variables. It was explored in earlier studies follow studies by Carroll and Wasylenko (1994); Wasylenko and McGuire (1985); and Plant and Pluta (1983). Carroll and Wasylenko used 1967-88 state data to test for structural change in the relationship between state and local fiscal behavior and national economic growth. Wasylenko and McGuire pay particular attention to jobs and taxes. Their results suggest state tax and expenditure variables significantly explain employment growth, but a follow-up study by Carroll and Wasylenko (1994) suggests a much smaller role for the fiscal variables.

Other studies such as that of Plant and Pluta used principal components analysis and a multiple regression model on pooled data for the 48 states to test the effects of four groups of variables (accessibility to markets; cost and availability of inputs; climate and environment; and business climate and state and local taxes and expenditures) on three separate measures of industrial growth (i.e. overall, labor-intensive, and capital-intensive growth). After controlling for the other factors, the business climate, tax, and expenditure variables as groups were found to be insignificantly related to overall state industrial growth but significantly related to state employment and capital stock growth. Their results suggest that overall state and local tax effort is an important determinant of state employment growth, but less important than the traditional market inputs (land and labor), emerging market inputs (e.g. energy), and climate variables.

Ashraf (2007) and Autor (2010) studied social, economic, and demographic trends that make a significant effect on the employment status of each individual. Author (2010) focused on the study of the earnings, employment rates, and labor market opportunities for workers with a different level of education.

Heyboer, J (1992) developed a proposal that longitudinally studies economic development and labor market processes in South Carolina counties. The key county level variables include economic growth, employment features, wages and personal income, income distribution and inequality. Gillis and Shaffer (1985) explored how counties without a suitably trained work force for the industries may not succeed in attracting them. Goode (1989) examined why even though lower wages count, counties with high per capita incomes may attract more firms and thereby generate more growth. Carlino and Mills (1987) investigated how infrastructure variables affect the location of firms and hence economic growth.

Greenwood et. al. (1985) studied how labor migration to counties with better economic prospects (e.g. better wages) may influence county employment growth. Browne (1984) explored why South Carolina has lower than average wage rates due to a preponderance of low wage industries and also lower than average wages within these industries. Falk and Lyson (1988) investigated why the South continues to lag behind the rest of the country in income (with urban incomes far greater than rural incomes), despite significant industrial development in recent decades.

Mustafa (1996) assesses the impacts of manufacturing, educational infrastructure, and governmental outlays (i.e. three key growth stimulants) on job creation and rural development in South Carolina. Secondary and primary data were applied in an econometric procedure that provided insights and guide to the current paper concerning terms of: (a) the time span used; (b) the list of variables used (the proposed study uses more variables, including quality of life variables as listed earlier); and (c) specific econometric equations specified and estimated.

Miley and Associate (2010) explain the impact of Boeing and BMW's investments on manufacturing employment and gross state product. The study indicates that these two investments have significant on South Carolina's manufacturing jobs, and income of the people.

Methodology and Data

This study developed five statistical models representing five major sectors of South Carolina. The five major sectors of South Carolina representing 70 percent of employment are reported in Table 2 and Figures 1-3 (Appendix 1).

Table 2: Five Major Sectors of South Carolina in Employment in 1989, 1999 and 2009

Economics Sector	1989	1999	2009
Services	20%	26%	41%
Government	19%	17%	16%
Manufacturing	21%	16%	9%
Finance, Insurance, and Real Estate	6%	6%	9%
Transportation and Public Utilities	4%	4%	3%

Services sector contributed the highest percent of jobs in South Carolina and reached 41% in 2009 comparing with 20% in 1989. Employment in Manufacturing sector dropped dramatically from 1989 to 2009 by 12% and remains on the level of

9% during the last years. There was a 3 % decrease in the Government sector from 19% in 1989 till 16% in 2009. The employment in Finance, Insurance & Real estate industry sector was stable during 10 years from 1989 to 1999 and changed to the higher employment rate of 9% during the period 1999-2009 years.

Statistical Model

To analyze the influence of business climate and quality of life variables on employment in five major sectors of economy of South Carolina, the following five statistical models are estimated:

$$LSEM = \beta_0 + \beta_1 LCIV + \beta_2 LEX + \beta_3 LNBE + \beta_4 PRT + \beta_5 LBRE + \beta_6 LVRE + \beta_7 LGE + \beta_8 LGSP + \beta_9 SEM_{t-1} + u \qquad (1)$$

$$LGEM = \beta_0 + \beta_1 LSEM + \beta_2 LEX + \beta_3 LNBE + \beta_4 PRT + \beta_5 LBRE + \beta_6 LVRE + \beta_7 LNGR + \beta_8 LGSP_{t-1} + \beta_9 GEM_{t-1} + u \qquad (2)$$

$$LMEM = \beta_0 + \beta_1 LMEM_{t-1} + \beta_2 LEX + \beta_3 LNBE + \beta_4 PRT + \beta_5 LBRE + \beta_6 LVRE + \beta_7 LCIV_{t-1} + \beta_8 LGSP_{t-1} + \beta_9 BAD_{t-1} + \beta_{10} CRM + u \qquad (3)$$

$$LFEM = \beta_0 + \beta_1 LSEM + \beta_2 LEX + \beta_3 LNBE + \beta_4 PRT + \beta_5 LBRE + \beta_6 LVRE + \beta_7 LNGR + \beta_8 LSEM_{t-1} + \beta_9 BAD_{t-1} + \beta_{10} LGSP_{t-1} + u \qquad (4)$$

$$LTEM = \beta_0 + \beta_1 LSEM + \beta_2 LEX + \beta_3 LNBE + \beta_4 PRT + \beta_5 LBRE + \beta_6 LVRE + \beta_7 LMEM + \beta_8 LNGR + \beta_9 LCIV + \beta_{10} LTEM_{t-1} + u \qquad (5)$$

Where,
LSEM= Log of Service Employment
LGEM= Log of Government Employment
LFEM= Log of Finance, Insurance, and Real Estate Employment
LTEM= Log of Transportation and Public Utilities Employment
LMEM= Log of Manufacturing Employment
LCIV= Log of Capital Investment
LGSP= Log of Gross State Product
LGE= Log of Government Expenditure
LEX= Log of Export
LNBE= Log of New Business Establishments
LBRE= Log of Number of Boat Registration
LVRE= Log of Number of Vehicle Registration
LNGR= Log of Number of Graduates
PRT= Property Tax Rate Per Capita
BAD= Percent Holding BA Degree
LCRM= Log of Number of Crime Incidents

Data

The five statistical models are estimated using South Carolina annual data for the period 1984 -2009. Data used in this study were collected from combination of sources. Employment by industry sector data was collected from the Bureau of Economic Analysis of the U.S. Department of Commerce. Percentage of high school and bachelor degrees data were obtained from the Education Profiles of South Carolina, Statistical Abstract and South Carolina Higher Education Statistical Abstracts. Number of crime incidents data came from the Uniform Crime Reports of the Federal Bureau of Investigation. Number of vehicle registrations data was collected from the Historical Information and Statistics of the South Carolina Department of Motor Vehicles. Number of boat registrations data derived from the Statistics and Reports of the National Marine Manufactures Associations and Boating Statistics of the U.S. Department of Transportation. Property tax rate per capita and Per capita income data were calculated using the sources of the U.S. Census Bureau, the Bureau of Economic Analysis and the Federal Reserve Bank of Richmond. Capital investment and Gross state product data were collected from South Carolina Department of Commerce. Government expenditure data was compounded from different sources such as the Bureau of Economic Analysis, the U.S. Census Bureau and the Department of Treasury. Export and New business establishment data were collected from the U.S. Census Bureau.

Empirical Results

Table 3 (Appendix 2) shows the descriptive statistics of dependent variables and Table 4 (Appendix 2) presents descriptive statistics of independent variables. Employment in service sectors, finance, insurance, and real estate sector, and transportation and public utilities sector have mild positive skewness, while government and manufacturing employment have mild negative skewness. The Kurtosis of each variable is below the benchmark of 3.0 for normal distribution except transportation and public utilities sector. The Jarque-Bera Statistics also indicate near-normality in the data distribution of each variable.

Table 4 reports summary statistics of independent variables. Log of capital investment, gross state product, government expenditure, new business establishments, number of boat registration, number of vehicle registration, property tax rate per capita, and log of number of crime incidents have mild negative skewness, while log of export, number of graduates, and percent holding bachelor degree have mild positive skewness. The Kurtosis of each variable is below the benchmark of 3.0 for normal distribution except log of number of graduates, percent holding bachelor degree and log of number of crime incidents. The Jarque-Bera Statistics also indicate near-normality in the data distribution of each variable except log of number of crime incidents.

To have a cursory look at the extent of multicollinearity, Table 5 (Appendix 3) reveals moderate multicollinearity between all variables except number of vehicle registration and government expenditure, number of boat registration and government expenditure, government expenditure and gross state product, number of boat registration and gross state product, new business establishments and government expenditure, new business establishments and number of boat registration - which are highly positively correlated.

The results of multivariate regression analysis of the factors that influence five economic sectors are reported in Table 6. The results of the first equation reflecting the service sector are significant. In this model, both adjusted- R-Square (0.9835) and F-statistics (160.5552) are very high, indicating that the independent variables explain the large percent of variability in the dependent – service sector. Based on the t-test, gross state product and previous period service have expected signs and are significant, and export variable is significant in this model and have unexpected sign. In government employment model, both adjusted- R-Square (0.9572) and F-statistics (60.7112) are very high and D-W statistics is close implying no autocorrelation. The overall model is quite good. The coefficients of service employment are significant but wrong sign, the coefficients of property tax rate per capita has expected sign and is significant, the coefficients of number of boat registration are significant but incorrect sign, the coefficient of government employment in the previous year is significant with correct sign. Overall manufacturing sector model is very good as adjusted R-square (0.9776), F-statistics (105.8252) are quite high and there is auto-correction as D-W is greater than 2. The coefficients of manufacturing employment in the previous year, number of boat registration, capital investment in the previous year, gross state product in the previous year and number of crime incidents are statistically significant. In fourth model, finance, insurance, and real estate employment, adjusted- R-Square (0.98912) and F-statistics (219.2112) are very high and D-W statistics is close implying no autocorrelation. So the overall model is very good. The coefficients of variables have expected signs and are statistically significant are export, number of graduates, new business establishments. The coefficients of variables of service employment, property tax rate per capita, number of boat registration, number of vehicle registration and percent holding bachelor degree have expected signs but they are not significant. The fifth model, transportation and public utility also performed well as adjusted- R-Square (0.8679) and F-statistics (16.7745) are very high and D-W statistics is more than 2 implying no autocorrelation. The variables which are significant and have expected signs are new business establishments, property tax rate per capita, and number of vehicle registration. The variables which have expected signs and are not significant export, capital investment, manufacturing employment, and transportation and public utilities employment in the previous year.

Table 5: Estimates

| | Dependent Variables | | | | | | | | |
| | **SEM** | | **GEM** | | **MEM** | | **FEM** | | **TEM** | |
Variables	Coefficients	**Variables**	Coefficients	**Variables**	Coefficients	**Variables**	Coefficients	**Variables**	Coefficients
Intercept	23.7660	Intercept	-0.2293	Intercept	-12.8862	Intercept	-10.3325	Intercept	-15.1104
	[1.8261]		[-0.1138]		[-2.8278]		[-2.0641]		[-2.4743]
CIV	0.0631	SEM	-0.1082	MEM t-1	1.0819	SEM	0.1264	SEM	-0.8109
	[0.9790]		[-2.4037]		[3.9673]		[0.7859]		[-3.8973]
EX	0.2487	EX	0.0350	EX	0.0654	EX	0.3586	EX	0.2185
	[1.4503]		[0.9189]		[0.6132]		[3.3722]		[1.2639]
NBE	-2.1048	NBE	0.2863	NBE	0.9052	NBE	0.8403	NBE	1.3278
	[-1.5146]		[1.3760]		[1.8330]		[1.6277]		[1.9201]
PRT	0.0022	PRT	-0.0112	PRT	-0.0155	PRT	-0.018085	PRT	-0.0746
	[0.0757]		[-2.1510]		[-1.1707]		[-1.3958]		[-3.2869]
BRE	-0.4371	BRE	-0.1249	BRE	0.0216	BRE	0.1258	BRE	-0.0754
	[-1.2823]		[-1.8402]		[0.1042]		[0.6299]		[-0.2871]
VRE	-1.2916	VRE	-0.0749	VRE	0.6752	VRE	0.4648	VRE	1.1003
	[-1.3296]		[-0.4538]		[1.6259]		[1.0685]		[1.7169]
GE	0.0617	NGR	-0.0019	CIV t-1	-0.0370	NGR	0.420310	MEM	0.4289
	[0.3773]		[-0.0377]		[-1.7833]		[2.5827]		[1.3672]
GSP	1.3507	GSP t-1	0.0701	BAD t-1	-0.3157	SEM t-1	0.1519	NGR	-0.3115
	[1.815]		[0.5214]		[-0.6594]		[0.8515]		[-1.1078]
SEM t-1	0.5870	GEM t-1	0.7953	GSP t-1	-0.7018	BAD t-1	0.3353	CIV	0.0553
	[2.3998]		[5.8899]		[-2.2757]		[0.6538]		[1.2526]
				CRM	0.3249	GSP t-1	-0.7671	TEM t-1	0.0571
					[2.4180]		[-2.0088]		[0.4135]
Adj R-squared	0.9835		0.9572		0.9776		0.9891		0.8679
F-stat	160.55		60.711		105.8252		219.2115		16.7703
Durbin-Watson stat	2.2319		1.8376		2.1354		1.9487		2.2747

t-statistic are reported in parentheses

Summary and Concluding Remarks

Descriptive statistics and multiple regression analysis are used to explore the impact of quality of life, business climate variables on the employment major sectors of South Carolina's economy. Using time series data of South Carolina for the periods 1984-2009 five regression models representing five major sectors of South Carolina (Service, Manufacturing, Government, Transportation and Public Utilities, Finance, Insurance and Real Estate) are developed and estimated. The results are mixed. Variables such as export, new business establishments, property tax rate per capita, number of vehicle registration, number of graduates, capital investment, and service employment are important drivers of employment in different sectors of the economy. The results suggest that commitment to higher education (quality of life), tax incentive (business climate), and encourage capital investment. Some limitations include size of data and lack of sufficient number of variables that indicate quality of life and business climate. South Carolina has been rated high as "business-friendly" for some years based on such things as tax burden. The results imply that the South Carolina development policy makers should promote export, improve quality of education and provide tax incentive to attract more businesses like BMW, Boing, and Amazon.Com.

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Appendix

Appendix 1

Figure 1: Percent Distribution of Employment in South Carolina by Industry Sector in 1989
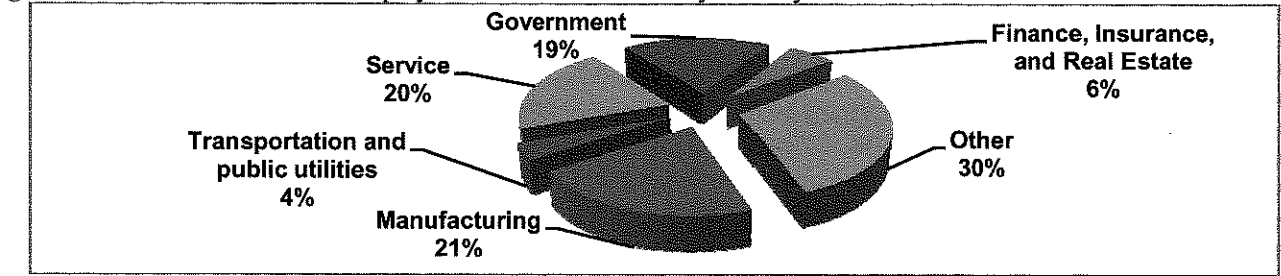
Figure 2: Percent Distribution of Employment in South Carolina by Industry Sector in 1999
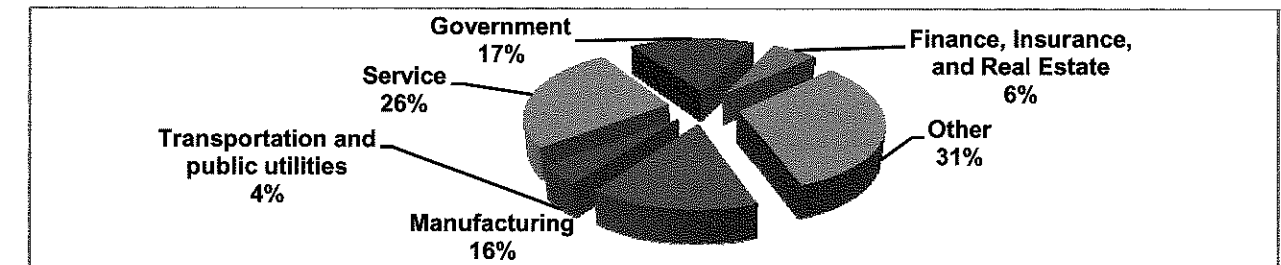
Figure 3: Percent Distribution of Employment in South Carolina by Industry Sector in 2009
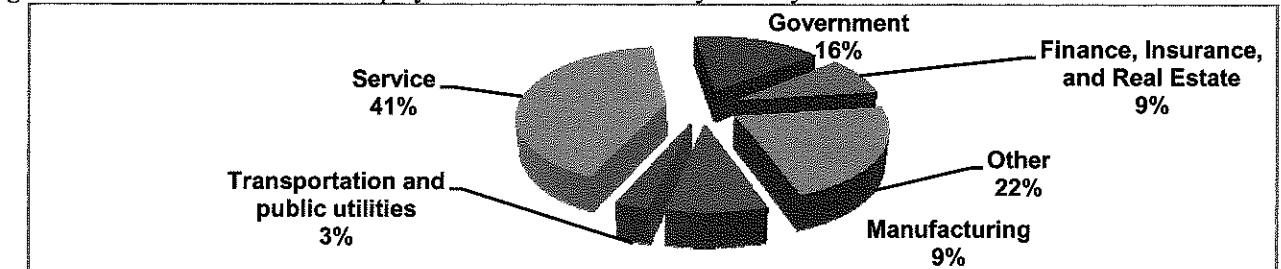
Appendix 2

Table 3: Summary Statistics of Dependent Variables

	LSEM	LGEM	LFEM	LTEM	LMEM
Mean	6.321216	5.898499	4.888985	4.338005	5.813825
Median	6.245003	5.897600	4.841891	4.304518	5.916809
Maximum	6.948190	5.996532	5.404253	4.687524	5.978448
Minimum	5.664352	5.770531	4.484752	4.117361	5.395031
Std. Dev.	0.429404	0.058095	0.274610	0.137142	0.177110
Skewness	0.173697	-0.344546	0.516358	0.722462	-0.927198
Kurtoisis	1.616216	2.578014	2.030542	3.657572	2.402964
Jarque-Bera	2.205170	0.707331	2.173550	2.730225	4.111506
Probability	0.332012	0.702110	0.337303	0.255352	0.127996
Observations	26	26	26	26	26

Table 4: Summary Statistics of Independent Variables

	LCIV	LGSP	LGE	LEX	LNBE	LBRE	LVRE	LNGR	PRT	BAD	LCRM
Mean	8.0588	11.405	9.6652	8.7771	11.395	12.736	7.9520	10.453	2.6935	0.5696	12.232
Median	7.9809	11.443	9.8144	8.7323	11.431	12.843	7.9522	10.434	2.7110	0.5665	12.277
Maximum	8.7605	11.988	10.671	9.8961	11.589	12.999	8.2019	10.668	3.8641	0.6040	12.349
Minimum	7.0286	10.644	8.3236	7.7472	11.086	12.260	7.6631	10.332	1.3108	0.5300	11.944
Std. Dev.	0.4827	0.4102	0.7400	0.6427	0.1475	0.2313	0.1562	0.0783	0.6698	0.0171	0.1071
	-		-		-		-		-		-
Skewness	0.3379	-0.2771	0.4880	0.1232	0.4930	-0.7067	0.0952	0.9942	0.1866	0.3244	1.3231
Kurtoisis	2.4243	1.9008	1.9299	1.8115	2.1801	2.2179	1.9338	3.6258	2.1753	3.2875	3.8217
Jarque-Bera	0.8538	1.6417	2.2724	1.5960	1.7813	2.8269	1.2707	4.7075	0.8876	0.5455	8.3169
Probability	0.6525	0.4401	0.3210	0.4502	0.4103	0.2433	0.5298	0.0950	0.6416	0.7613	0.0156
Observation	26	26	26	26	26	26	26	26	26	26	26

Appendix 3
Table 5: Correlation Among Independent Variables

	SEM	GEM	FEM	TEM	MEM	CIV	GE	GSP	NBE	PRT	NGR	VRE	BRE	CRM	BAD
SEM	1.00														
GEM	0.88	1.00													
FEM	0.97	0.87	1.00												
TEM	0.27	0.48	0.30	1.00											
MEM	-0.96	-0.81	-0.95	-0.13	1.00										
CIV	0.11	0.24	0.12	0.81	0.06	1.00									
GE	0.97	0.91	0.96	0.40	-0.92	0.22	1.00								
GSP	0.97	0.92	0.96	0.46	-0.91	0.27	0.99	1.00							
NBE	0.92	0.92	0.90	0.56	-0.83	0.40	0.96	0.98	1.00						
PRT	-0.22	-0.06	-0.29	0.20	0.37	0.44	-0.12	-0.14	-0.02	1.00					
NGR	0.54	0.41	0.66	-0.05	-0.66	-0.18	0.53	0.51	0.38	-0.57	1.00				
VRE	0.96	0.93	0.95	0.47	-0.89	0.30	0.99	0.99	0.98	-0.10	0.49	1.00			
BRE	0.84	0.85	0.83	0.65	-0.72	0.52	0.91	0.93	0.97	0.06	0.29	0.93	1.00		
CRM	0.44	0.63	0.44	0.61	-0.26	0.49	0.53	0.56	0.68	0.38	-0.13	0.58	0.74	1.00	
BAD	0.62	0.45	0.70	-0.19	-0.67	-0.28	0.59	0.56	0.48	-0.26	0.61	0.54	0.43	0.26	1.00

Co-integration in and Diversification Benefits from Sub-Saharan Capital Markets: The Case of Kenya, Tanzania, and Uganda

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Abstract

A watershed change in Eastern African Community (EAC) occurs as the five-member countries push for a monetary union, with 2012 as the target date. Rising interest and renewed foreign investments in these areas warrant a close look at the performance of portfolio investments in the earlier EAC members. Correlation analysis of the capital markets is implemented to explore if any international diversification benefit exists. Results indicate that diversification benefits are minimal, given high correlations among the members. Evidence supporting the trivial diversification gains is provided by co-integration analysis and the study of the linkage between credit markets and FOREX market.

Introduction

An economic and political integration is a major trend in the global economy. Genesis of euro in January 1999 was a cultivated outcome of European Monetary Union. Another watershed change is occurring as three east African countries: Kenya, Tanzania, and Uganda plus recently joined two other east African nations push for a monetary union, with 2012 as the suggested target date. In 1993, Kenya, Tanzania, and Uganda signed on an agreement for the establishment of the "Permanent Tripartite Commission for East African Community (EAC)." Since then, the EAC has advanced its integration agenda rapidly. A treaty establishing the EAC was signed in 1999, a customs union treaty in 2004, and a Common Market Protocol (CMP) in 2009. The EAC has a stated objective to form a monetary union, with 2012 as the suggested target date.

Several studies examined a planned EAC monetary union. Buigut and Valev (2005) utilized a structural vector autoregressive model to determine whether the proposed East African Monetary Union is an optimal currency area. Their impulse response analysis did not yield strong support for forming a currency union. A recent study by Buigut (2011) provided, however a favorable evidence for a Monetary Union among the EAC countries, only if all the member countries complete significant adjustments to align their monetary policies. Using a cost – benefit analysis, Debrun et. al (2010) found that the mutual restraint on monetary policy is an important determinant of the expected benefit from an EAC monetary union.

Along with the economic integration efforts of the EAC members, international investment communities have shown a renewed interest in the region as well. Since 2002, foreign equity investments have been increased by 573% in Uganda. Although the foreign investments have fluctuated in Kenya year to year, average annual growth rate was remarkably high, 173%. Moreover, the recent figures become more stable and promising. On the other hand, Tanzania's growth rate is relatively small, but its growth rate is the most stable and steady in the region (i.e., 5.57%) in Table 1.

Table 1: Descriptive Statistics on Foreign Equity Investments in Selected EAC Countries from 2002 to 2009

	Kenya	Tanzania	Uganda
Mean	176%	5.57%	573%
Median	-2.34%	5.65%	59.87%
Max.	1,005%	6.84%	3,610%
Min.	-78%	4.51%	-46%
S.D.	401	0.86	1,344

Another positive aspect of the EAC members is that their economies have turned to more of open economies. By examining a ratio of the sum of exports and import to GDP, one can easily document that the total trade with respect to GDP was steadily increasing for Tanzania and Uganda. As for Kenya, the total trade volume with respect to its GDP did not grow dramatically over the past two decades. However, the country always has the highest openness measure, with the total trade volume being 58.75% of its GDP on average.

Few studies examined the impacts of foreign direct investments on the African economies. Basu and Abekah (2008) analyzed the economic growth of 47 African countries. They found that the FDI had a positive effect on the growth of GDP

because the FDI brings a good deal of capital, technology and management skills to the hosting countries. Another study (No et al., 2008) focused on FDI in Rwanda. Using a multivariate time-series model, they examined the determinants of FDI inflows into Rwanda and found that economic growth and trade openness have a significant positive impact on foreign direct investment inflows in Rwanda.

Also, the financial sectors in these areas become very active. Despite the fact that the financial sectors in Kenya, Tanzania, and Uganda are dominated by commercial banks, stock exchanges can be viewed important and vital institutions for their economies to grow (MBendi: Information for Africa, 2008). The Nairobi Stock Exchange in Kenya was established in 1954. It is one of the oldest and sub-Saharan fourth-largest exchange where fifty stocks are currently listed. Tanzania Dar es Salaam Exchange began its operation in 1998. Currently, the exchange lists fourteen common stocks, five corporate bonds, and eight Tanzania government bonds open for foreign investors as well as local investors. The Uganda Securities Exchange, which was launched in June 1997, is run under the jurisdiction of the Capital Markets Authority, which reports to the Central Bank of Uganda (The Journal for the Capital Markets Industry, Uganda, 2007). Fourteen common stocks and twenty-one bonds are currently listed.

Even though there is the rising interest in the EAC members and in equity markets, no previous research examined the diversification benefits of portfolio investments in this region from investors' perspective. The purpose of the current research is to examine an international diversification benefit among the EAC members, if any.

Data

To minimize an inconsistent data problem, the study uses one data sources: *Global Insights* on online. The sample period spans from 1981 to 2008. All the annual observations of 28 were obtained from various databases complied on *Global Insights*. For instance, total trade volumes (the sum of imports and exports) in local currency are recorded in the balance of payments. They were obtained from International Monetary Statistics on *Global Insights*. Gross Domestic Product (GDP) is nominal.

Exchange rates are expressed in American terms. Uganda exchange rates are, for instance, expressed as so many U.S. dollars per Uganda shilling. Annual Kenya interest rates are its Treasury bill rates. Corresponding U.S. interest rates are used to compute a relative interest between the U.S. and Kenya. Annualized Tanzania interest rates are its central bank discount rates. To compute a relative interest rate between the U.S. and Tanzania, the U.S. Federal Reserve bank discount rates are used. Because of inconsistent interest rates for Uganda, time deposit rates are used for a relative interest rate with respect to that of the U.S. The study uses a capital account as a proxy for a capital market in each country. The capital account is the sum of equity accounts in commercial banks and other financial institutions in each country.

Methodology

Diversifying across markets does not necessarily provide risk reduction in a portfolio. Rather, diversifying by lower or negative correlation reduces market specific risks. With perfect negative correlations between two capital markets, an even split of investments in two capital markets would render investors an ideal diversification benefit: zero risks. To examine whether there is a portfolio diversification benefit, the study computed a correlation matrix among three market capitalizations.

To further confirm the results of correlation analysis, a co-integrating analysis is applied to see whether the national capital markets move together in the long run. More formally, consider a trivariate vector autoregressive (VAR) model with the order of p. X is a three dimensional column vector of the national capital accounts. The VAR(p) model can be reformulated into vector error correction model (VECM) of the form:

$$\Delta X = \Pi X_{t-1} + \sum_{i=1}^{p-1} \Pi_i \Delta X_{t-p} + \delta_0 + \delta_1 t + v_t \qquad (1)$$

$\Pi = \alpha\beta`$, where α represents the speed of adjustment to disequilibrium and β is a matrix of long-run coefficients, with each being n x r matrices. The δ_0 and δ_1 are n x 1 vectors of constant and trend coefficients. If the rank of Π matrix is zero (r = 0), then Π =0, meaning that there is no linear combination of X_t that is stationary. If the rank of Π matrix is equal to n, then X_t is a stationary process. In the intermediate case, 0 < r < n, there are r stationary linear combinations of the elements of X_t and n-r stochastic trends. Given $\Pi = \alpha\beta`$, the relation between α and deterministic term, $\delta t = \delta_0 + \delta_1 t$ is critical to identify the data generating process of X_t. Johansen (1995) suggested five different models for the relation. Enders (2004) suggested that if there is no strong theoretical belief, then researchers should use the model that the level data have linear trends but the co-integrating equations have an intercept only.

Testing for co-integration amounts to finding the number of $r \le$ (n-1) linearly independent columns in Π (i.e., the rank of Π). The trace statistic (λ_{trace}) tests the null hypothesis that the number of distinct co-integrating vectors is less than or equal to r against a general alternative that rack (Π) = n. An alternative test, the maximum eigenvalue statistic (λ_{max}) tests the null that the number of co-integrating vectors is r against the alternative of r+1 co-integrating vectors.

Lastly, the study explores the linkage between local credit market and foreign exchange market so as to examine the performance of foreign investments in each country separately. In other words, the paper examines the law of one price in investments in each country. To elaborate on the theory, consider an investor who has to place a certain amount of domestic currency short-term.

For each unit of domestic currency placed at home short term, the investor will obtain, after the predetermined period has elapsed, the amount $(1+ i^{home})$ in dollars, where i^{home} is return on investment in domestic country during the predetermined period. Alternatively, the investor can buy foreign currency spot and place it abroad for the same period of time. In other words, $(1/SP)$ of foreign currency is obtained per unit of domestic currency and the amount $(1/SP)(1+ i^{foreign})$ of foreign currency will be obtained at the end of period, where $i^{foreign}$ is the foreign interest rate.

To eliminate any exchange rate risk, the investor can now sell that amount of foreign currency forward: thus she will obtain, after the predetermined period has elapsed, the amount, $\frac{FW}{SP}(1+i^{foreign})$ of domestic currency with no exchange risk.

The profit maximizing investor will place the funds at home or abroad according as

$$(1+i^{home}) \underset{\succ}{\overset{\prec}{=}} \frac{FW}{SP}(1+i^{foreign}) \qquad (2)$$

However, arbitrageurs in foreign exchange market will ensure to equate the returns on domestic investment, $(1+i^{home})$ in domestic currency and the returns on foreign investment, $\frac{FW}{SP}(1+i^{foreign})$ in domestic currency. The relationship is known as covered interest rate parity (IRP).

Mathematically, the IRP can be written as follows:

$$FW = SP\left[\frac{1+i^{home}}{1+i^{foreign}}\right] \qquad (3)$$

To make the IRP equation (2) in linear form, take a natural log to both sides of the equation to get:

$$lnFW_t = lnSP_t + lnRL_t, \qquad (4)$$

where *lnFW* is forwards rate in natural logarithm at t=0, *lnSP* is spot exchange rate in natural logarithm at t=0, and *lnRL* is relative domestic interest rate with respect to foreign interest rate in natural logarithm.

Further, for linear regression analysis, the equation (4) can be written as follows:

$$LnFW_{i,t} = \beta_0 + \beta_1 lnSP_{i,t} + \beta_2 lnRL_{i,t} + \varepsilon_{i,t}, \qquad (5)$$

where β_0, β_1, and β_2 are parameters to be estimated and ε_t is error terms. The paper will conduct a test if $\beta_1 + \beta_2 = 1$. The rejection of the null of $\beta_1 + \beta_2 = 1$ indicates that the IRP does not hold and that there is a risk free arbitrage profit for an investor. This suggests that an investor might explore a profit strategy by focusing on one specific country rather than allocating assets in different countries to form a portfolio.

Empirical Results

Despite considerable differences in cultures, politics, and economies, the correlation coefficients of capital accounts across nations are all positive and greater than 0.5 in Table 2. More specifically, the correlation between Kenya capital account and Uganda capital account is 0.93, which is near perfect correlation. This suggests that an investor gain little

diversification benefit from the international portfolio. Although the magnitude of the correlation between Uganda and Tanzania capital accounts is smaller than that between Uganda and Tanzania capital accounts, the coefficient is much larger than what the other studies. For instance, Tang (1995) reported the correlation coefficient among seven Asian emerging stock markets ranges from 0.34 to 0.57. Even within the U.S, Chan et al. (1999) estimated that the average correlation coefficient between two randomly selected stocks was 0.28. In sum, the estimated correlation matrix suggests that capital accounts across the nations move very closely. The portfolio investment evenly split in three countries does not warrant any significant diversification benefit.

Table 2: Correlation Coefficients of Capital Accounts in Selected East African Community Countries from 1981 to 2009

	Kenya	*Tanzania*	*Uganda*
Kenya	1.00		
Tanzania	0.58	1.00	
Uganda	0.93	0.76	1.00

To further examine the close co-movement of three capital markets, the study conducts a modern time series analysis, co-integration analysis. Before carrying out any co-integration tests, the paper tests each time series for unit root using the Augmented Dickey Fuller (ADF) and Philips –Peron (PP) tests. The results of the ADF and PP suggest that all three variables are non-stationary. The detailed test results are not included in this paper, but they are available upon request from the authors. The study proceeds to co-integration analysis and followed the Johansen procedure (1990). A trivariate vector error correction (VEC) model is set up for three capital accounts. To select the appropriate lag length, the Akaike Information Criterion was used. The AIC suggests that a leg length of one is optimal. The results of co-integration tests are presented in Table 3. Both the Johansen lamda trace and lamda max statistics indicate that there is one co-integrating equation, meaning the three variables move together in the long run. Thus, these results support that the diversification benefits from a portfolio of investments in the EAC member countries is minimal.

Table 3: Johansen λ_{trace} and λ_{max} Test Results

Null Hypo.: *NO CE(s)*	*Alt. Hypo.:* *NO CE(s)*	*λ Trace* *Test Stat.*	*C.V.*	*λ Max* *Test Stat.*	*C.V.*	*Eigenvalues*
= 0	>0	46.36	29.80	36.20	21.13	0.76
≤1	>1	10.16	15.49	6.70	14.26	0.23
≤2	>2	3.47	3.84	3.47	3.84	0.13

Given little benefit of portfolio diversifications, the study proceeds to examine if any stand-alone investment in each country can provide substantial positive returns with a minimal risk. This question can be addressed by examining whether covered interest arbitrage (CIA) holds for each country. Since forward currency markets for Kenya Shillings, Tanzania Francs, and Uganda Shillings do not exist or minimal, the study used one period ahead of historical spot rate, SP_{t+1} as a proxy for forwards rates. The CIA model dictates theoretical expected signs. That is, the parameter estimate, β_1 is negative; on the other hand, β_2 is positive. β_1 shows the relationship between the spot exchange rate and forward Rate, β_2 shows the relationship between the relative interest rate and forward fate.

For Kenya, the positive relationship between spot and forward rates are significant in Table 4. Since all variables are in natural logarithm, one can say that one percent increase in spot exchange rates lead to an increase in forwards rates by 0.92%. An estimated relationship between a relative interest rate and forwards rate is positive, although it is not significant. In order for covered interest arbitrage to hold, the sum of $\beta_1+\beta_2$ should be equal to one. Test results indicate that no arbitrage condition holds for Kenya, because p-value is much greater than 0.05. This indicates that the foreign exchange market for Kenya shillings is sync with the interest rates in the Kenyan credit market, implying that there is no arbitrage risk free profit.

For Tanzania, all coefficients are significant including an intercept term. A one percent increase in relative interest rate leads to an increase of 1.07% in forwards rates. The forwards rate would respond to one percent increase by moving its rate by 0.92%. A hypothesis test of $\beta_1 + \beta_2 =1$ is strongly rejected. This suggests that the covered interest arbitrage condition does not hold, meaning that an international investor could garner a risk free return if there are no market barriers, transaction costs, and commission fees.

As for Uganda, the estimated covered interest arbitrage equation shows that all coefficient estimates are statistically significant. A considerable impact of changes in relative interest rates is on forwards rates. Moreover, its magnitude is the biggest among three countries. Also, the null of no arbitrage risk free profit is strongly rejected, indicating that a substantial positive return can be obtained with a minimal risk.

Table 4: Estimated Covered Interest Arbitrage Equations for Selected EAC Countries from 2002 to 2009

Independent *Variables*	*Dependent Variables*		
	lnFW$_{KE}$	lnFW$_{TA}$	lnFW$_{UG}$
Intercept	-0.35 (-3.10)**	-0.53 (-3.75)**	-0.82 (-9.64)**
lnSP	0.92 (28.75)**	0.92 (38.14)**	0.88 (62.57)**
lnREL	0.12 (0.44)	1.07 (2.04)**	1.91 (3.86)**
R^2	0.97	0.98	0.99
D.W.	1.83	2.49	0.91
Test: p-value $\beta_2+\beta_3 =1$	0.77	0.001	0.0008

Note that the number in parenthesis is t-statistics and the symbol ** indicates that the coefficients are significant at the 5% level.

Summary

Although African countries, in general, have received limited benefits from the expansion of globalization in the last few decades, a watershed change in the Eastern African Community is occurring as it added Burundi and Rwanda as new members and pushes for a monetary union, with 2012 as the suggested target date. Several papers reported a rising interest and renewed foreign investments in these areas. However, no study has been done to examine if any international diversification benefit exists in this region. Any significant diversification benefits induce an increase in foreign portfolio investments, which contributes an economic growth in this region. However, results of correlation analysis suggest that minimal diversification benefits exist.

Co-integration analysis indicates the capital markets of the EAC move closely together in the long run, supporting the implications of estimated correlation coefficients. By deviating from a portfolio investment, the study proceeds to examine if any stand-alone investment strategy is viable. So, the study looked into a linkage between an individual credit and foreign exchange market. Estimated CIA equations suggest that the simultaneous investments in credit market in Tanzania or Uganda and foreign exchange market for Tanzania or Uganda currency could provide an investor better profit strategy with a minimal risk. However, the similar investment strategy does not warrant positive returns with minimal risks for a stand-alone investment in Kenya.

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Appendix

Kenya Capital Accounts: Kenya Shillings, Millions
Kenya Exchange Rates: Kenya Shillings per Dollar
Kenya Interest Rates: Treasury Bill Rates
Tanzania Capital Accounts: Tanzania Shilling, Billions
Tanzania Exchange Rates: Tanzania Shilling per Dollar
Tanzania Interest Rates: Central Bank Discount Rates
Uganda Capital Accounts: Uganda Shillings, Billions
Uganda Exchange Rates: Uganda Shillings per U.S. Dollar
Uganda Interest Rates: Time Deposit Rates
The U.S.Interest Rates: 3 Month T-Bill Rate, The Fed Discount Rate

The Estimation of Price and Income Elasticities of Alabama Residential Electricity Demand

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Abstract

The objective of this study is to estimate the short-run price and income elasticities of Alabama residential electricity demand. The empirical findings are compared with Halvorsen's study. The estimated price and income elasticities in our study are markedly higher. This difference could be partially explained by the fact that we estimate the electricity demand in a different market and in a different time period.

Introduction

Price and personal income have been considered as the two most important determinants of electricity demand; and a number of prior studies have included both variables in estimation models. To study the behavior of consumers, short-run price and income elasticities of electricity demand are estimated in this study. Short-run price electricity has been used to assess the effectiveness of using price as a measure for rationing the supply of electricity during periods of temporary capacity shortage. This study estimates a system of log-linear models with price and personal income as covariates to obtain short-run price and income elasticities of Alabama residential electricity demand from 1978 to2008, inclusive.

Model and Variables

Prior studies have indicated that annual residential electricity price (P_t) is negatively correlated with residential electricity consumption (Q_t) and positively correlated with total personal income (Y_t). Residential electricity consumption per capita (Q_t) is a function of residential electric consumption per capita in the previous period (Q_{t-1}), annual residential electricity price (Pt), and per capita income (I_t). These relationships can be expressed in a system of log-linear equations as:

$$\ln P_t = a_o - a_1 \ln C_t + a_2 \ln Y_t + U_t \qquad (1)$$

$$\ln Q_t = b_o - b_1 \ln Q_{t-1} + b_2 \ln P_t + b_3 \ln I_t + E_t \qquad (2)$$

where, respectively, a_o, a_1, a_2 are the estimated coefficients, and U_t, the random error term of equation (1); and b_o, b_1, b_2, b_3 are estimated coefficients, and e_t, the random error term of equation (2). The variables can be explained as: P_t = The 29-year (1979-2008) Alabama residential electricity real price per kilowatt hour (KWH), C_t = The 29-year (1979-2008) Alabama residential electricity total consumption in millions of KWH, Y_t = The 29-year (1979-2008) Alabama real personal income, Q_t = The 29-year (1979-2008) Alabama residential electricity consumption per customer in thousands of KWH, Q_{t-1} = The 29-year (1978-2007) Alabama residential electricity consumption per customer with one year lag in thousands of KWH, and I_t = The 29-year (1979-2008) Alabama real per capita personal income.

Data

Both the Alabama residential electricity consumption and residential electricity price are obtained from the U.S. Energy Information Administration. Alabama total personal income, per capita personal income, and Alabama population were extracted from Bureau of Economic Analysis Regional Economic Accounts.

Empirical Results

Statistics of the log-linear models estimated using two-stage least squares technique (2SLS) are listed in Table 1. As expected, the sign of each coefficient in the equation is consistent with the findings in the prior studies. For equation (2) b_2 is -0.3298, which confirms the negative relationship between price (P_t) and demand for residential electricity (Q_t). The coefficient b3 is 1.1606, indicating a positive relationship between per capita income (I_t) and the demand of residential electricity (Q_t). Every coefficient except the coefficient for Q_{t-1} in Equation (2) in the model is statistically significant; and the

significance level ranges between 0.0001 and 0.523. The coefficient of determination (R^2) is 0.71 and 0.97 for equations (1) and (2) respectively, showing that the predictive power of the model is markedly robust.

Table 1: Two-Stage Least Square Regression Statistics of Alabama Residential Electricity Demand

Endogenous Variables	Types of Statistic	Intercept	Exogenous Variables				
			Q_{t-1}	C_t	Y_t	P_t	I_t
P_t							
	Estimates	-19.8767		-1.2645	1.8319		
	t-value	-4.13		-2.38	3.23		
	Std. Error	4.8139		0.5323	0.5665		
	Significance	0.0001		0.021	0.0021		
	$R^2 = 0.7118$						
Q_t	Estimates	-15.5591	0.1175			-0.3298	1.1606
	t-value	-5.1	0.64			-2.65	5.1
	Std. Error	3.0527	0.1829			0.1243	0.2275
	Significance	0.0001	0.5231			0.011	0.0001
	$R^2 = 0.9716$						

Table 2: Price and Income Elasticities of Alabama Residential Electricity Demand

Elasticities of Demand	Present Study (1979-2008)	Halverson's Study (1961-1975)
Short-Run Price	-0.3298	-0.025
Short-Run Income	1.1606	0.117

Statistics of price and income elasticity of Alabama residential electricity demand are shown in Table 2. For comparisons; results of Halvorsen's study are also included in this Table. The short-run price elasticity of Alabama residential electricity demand is inelastic, while the short-run income elasticity is elastic. As expected, the sign of the price elasticity coefficient is negative, and that of income elasticity is positive, which is consistent with Halvorsen's findings.

The short-run price elasticity of the periods of 1979 to 2008 is -0.3298, indicating that Alabama residential electricity demand (Q_t) is inelastic to changes in the residential electricity price (P_t), i.e. an increase in price by 1 percent would reduce residential electricity consumption by 0.3298 percent. Short-run income elasticity is 1.1606, which is elastic and different from Halverson's study. An increase in per capita income by 1 percent would increase Alabama residential electricity consumption (Q_t) by 1.1606 percent. High-income consumers are likely to spend proportionally more on electric consumption than low-income consumers.

Conclusions

In this study, we estimate the average per capita demand for residential electricity in Alabama for the period from 1979 to 2008. We estimate a system of log-linear equations with real personal income per capita and average real price as covariates to obtain the short-run price and income elasticities of Alabama residential electricity demand. The estimated price and income elasticities in our study are markedly higher than those in Halverson's study. The difference could be partially explained by different periods of study and different markets of study. Our study estimate the demand for electricity in Alabama for the period from 1979 to 2008, while Halverson's analysis is based on the national data from 1961 to 1975.

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Analysis of Value Added and Productivity in Corporate Social Responsibility: Special Consideration to Clusters in Spain

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Abstract

The development of Corporate Social Responsibility has changed business models of companies because that involves a modification both of the performance and business goals. CSR involves the awareness of the external effects of firms in terms of sustainability and quality in their actions, which it leads to beneficial effects on the companies and in its environment relations, as well. In this paper, we propose a model of CSR to analyze the Value Added, specifically in terms of productivity, for SMEs in Spain, comparing two situations: before CSR and after CSR and how SMEs adjusts their production plans within clusters.

Introduction

Corporate social responsibility (CSR), can be defined as the active and voluntary contribution to social, economic and environmental firms, usually with the aim of improving their competitive position and added value. So, Corporate Social Responsibility goes beyond laws and regulations; in this sense, labour laws and regulations related to the environment are the starting point to environmental responsibility. Compliance with these basic policy does not match Social Responsibility, but with the obligations that any company must meet simply because of his activities. It would be difficult to understand allegation by a company's CSR activities if it has or does not comply with the legislation referred to their activities.

Corporate social responsibility (CSR) aims for excellence within the company, taking with special attention to people and their working conditions and the quality of their production processes.

CSR in Spain: Facing the crisis

The economic scenario in 2009 is very different from that in 2008 Report. Nobody at that time could foresee the extent and consequences of the next crisis. Remember that this Crisis is characterized by globalization: no region of the world and virtually any sector have been away from its influences.

Started in the global financial system, the crisis has moved to all economies and in some cases, has increased the impact on some specific sectors such as the home sector in Spain, for instance. This has led to falls in GDP, a massive destruction of wealth and a significant increase in unemployment rates. The crisis has also affected a large number of companies in the way of severe adjustment of production capacity, downsizing staffs and even their disappearance. The social debate today seems to focus on the duration of the economic crisis, that is, at the time that produces the onset of recovery, although some analysts point out that it is very difficult to attend again to growth rates as the time before.

But perhaps one of the greatest damage caused by the economic crisis at the international level, has been the confidence in financial regulation, and also the strength of the codes of good governance. The social alarm arose especially in countries where companies are governed by structures of government based on the capital market, and has triggered public awareness of the salaries enjoyed in the past by the directors of companies in crisis. The combination of powerful economic incentives, poor corporate governance bodies and the apparent myopia of the equity markets have led to disproportionate rewards unrelated to long-term results of some companies. Today, the debate seems to be in several dimensions. The first relates to the need or not to initiate some regulation on incentives, especially in the financial system. It is clear that such regulation will be effective only if its principles are shared in all developed economies. No one would expect the G-20 and the coordination of regional regulators to prevent national fragmentation of regulation. A second dimension refers to one of these causes of excess, that is, the myopia of the equity markets. Here, the debate focuses on improving the transparency of compensation, moving to laws which until now, were only recommendations. From these two dimensions, certainly, which should lead to greater attention is referred to incentives for directors and managers of the financial system and, in general, companies which, by their size and influence, enjoy public insurance bankruptcy. Although there is much to be done, it seems that the deepening of the codes of good governance and even his elevation to the status of rule of law give closure to the debate.

But perhaps the closest dimension to the subject that is, the future of the business culture of the RSC, is the social observation, expressed sometimes with popular writing, of the exaggerated salaries enjoyed by officers and directors entities, which by their scope, have survived in the vicinity of the windows of public budgets. It is true that, in technical terms, the issue of equity is less important because of its effects, the consequences for the design of incentives and stakeholders clearly erroneous. However, public awareness of these practices has generated a great distrust of the business institution. The culture of CSR aims to align the interests of different groups that take part in the business.

The marginalization of one selfish, directors and executives is not free. It is true that the situation is not new. In the wake of the emergence of large corporations back in the early decades of the twentieth century, it was studied that the main problem of the separation of ownership and control of large corporations was the decoupling of the interests of shareholders and directors.

The truth is that the ground is fertile ground for scepticism. One can guess that will reform the governments of developed economies is cyclical, that is stated in the most critical moments of the cycle and forget when you start the process of economic recovery, pending what happens in next cycle. There is evidence to suggest that, in terms of what has been termed grand remaking of capitalism, last quarter leading up to the major developed economies begin to see positive economic growth.

It should also be sceptical if they are to CSR policies of companies contribute to the restoration of trust in companies and markets. Certainly, not hinder, but is too large distance between the institution's business challenges and the strength of CSR policies.

The Element of our analysis: The tourism sector in Spain

In 2010 Spain received 52.7 million tourists, 1% higher than in 2009. It shows the important role played by certain European destinations such as France and Italy, as the Spanish traditional source markets, the United Kingdom and Germany, have ended the year with negative numbers.

During the month of December Spain received 2.6 million international tourists, registering a decline of 4.6% compared to 2009, representing just less than 124,000 tourists. This slight decline is explained in the context of the wildcat strike of air controllers and the closure of several European airports caused by adverse weather conditions that also took place in December. A year of transition in changing the trend by breaking two consecutive years of declines and marks a new phase that is presumed to sustained recovery. Yet the year 2010 can be described as turbulent, as it has had to deal with external effects that have affected the evolution of tourism, as with the two impacts identified in the month of December, the year 2010 started with the effects of volcanic ashes from Iceland that reduced the flow of tourists in the first half of the year.

The main markets fell in December, with the exception of France and the Nordic countries as a whole and in the case of major regions, all showed declines, except Canarias Islands and Madrid.

The current status of tourism in Spain

The sustainability of the current Spanish tourism model is affected by several factors: urban development, new emerging destinations, due to growth and improving infrastructure, tourist flows in Spain are concentrated in summer, the difficulties in attracting and retaining the best professionals in determining perceived service quality, poor knowledge management and innovation in the sector, new technologies and especially Internet, that changes our habits and the way in which companies approach the development of their business. In this particular case, Tourism is one of the most affected: More and more tourists use the Internet to plan their trips. According to the latest data available, 55% of those who visited Spain in 2010 have used the Internet.

Trends

We have observed the next ones:

First, the new configuration of the EU will broaden the market and developments in the geopolitical stability in the southern Mediterranean countries, will affect the results of Spanish Tourism.

Second, population growth will cause most of the world's population lives in cities and will be marked by a progressive aging of the population, most notably in European countries.

Third, the consolidation of a middle class in emerging economies and new family structures in developed countries.

Fourth, the transportation improvements will enhance the tourism development and facilitate access and mobility of tourists.

And finally, knowledge management and environmental organizations will be the key to the development of competitive advantage and differentiation.

In 2011, two factors will have opposite effects:

1. - The consumption will grow over income, which is a positive factor: This means that savings will decrease. The consumer has already passed the stage of fear and dare to increase consumption above what their income increases, which is a positive

factor for domestic tourism demand in 2011. However, this situation will occur also in companies, leading to increases in defaults.

2. - The national consumers' disposable income will be reduced enough, it is a negative factor: Due to higher taxes, tight credit and unemployment, domestic demand will contract further.

International tourism demand

But 2011 may be a year of tourism business opportunities, but will be out of Spain, because the Spanish tourism industry becomes dependent on British and German market, the latter in full recovery and should continue to seek their place in the BRIC markets, as explained below, the U.S. market is not at all clear (in spite of its growth), and in 2011 it is expected that the dollar drop further and the trend of disappearance of airlines and routes, due to the increased supply of bills over the increased demand and the expected rise in fuel in about 15% in 2011.

These two factors will lead to low margins of many companies in favour of those that have trade with the BRIC countries (Brazil, Russia, India and China), Mexico and the U.S.

Concerning with hotels in 2011, more than ever, the demand for hotel (the hotel customer) will find the value added logical consequence of the oversupply and market transparency. Many people say that the problem of hotel industry is the price, but we consider that it is a problem of value.

For example, if you manage a hotel, take the sales at the end of 2011, subtract them from the 2010 sales, and find out if your hotel has an added value that the market appreciates. If the difference is positive and greater than 10%, it means that your hotel has an added value that the market perceives. If the difference is negative or less than 10%, the hotel has no added value or poorly marketed.

On the other hand, nowadays only well-managed companies have access to credits. Besides the problem of value added, many hotels are not oriented well in the market, are dedicated to giving "flying blind" in the various segments and channels, see what falls. The solution is to know the opportunity costs of marketing and profitability of each customer.

Moreover, the budgets of tourists are limited; there is a disposable income to spend on tourism. It must analyze the value chain of our business, eliminating non-value adding components clear and adding those that add value. Every day there are new accessories as tourism consultants, brokers, outsourcing, online services, advertising, content, inventions, systems, technology.

Finally, the government must be involved with the tourism sector basically in five basic points:

1. To pay the bills in the statutory dead lines (30 days).
2. To promote the tourist business taxation.
3. Providing the security and confidence to foreign tourists come to Spain. Efficient transportation (have to get a legal framework at all times ensure passenger) and sensible regulations (no more ridiculous rates for tourists and wasteful subsidies).
4. We will welcome the specific campaigns that are being doing in the mature and emerging markets issuers, when I say "concrete" I mean focused, targeted, and show the added value of Spain compared to competing destinations.
5. It is necessary austerity in government, to stop experimenting with taxpayer money, people and businesses. In short, we need a deficit reduction of waste.

Clusters and CSR in the tourism sector in Spain.

Tourism represents a way to facilitate access to market opportunities and income for small and medium enterprises, especially in developing countries. The role of the tourism industry is very important, considering that the major component of their product is the destination and therefore society and the environment or cultural environment where the activity occurs.

The development of the sector represents the way forward in order to preserve ecosystems and biodiversity, while improving the quality of life of communities.

Position sustainability as a priority component of the quality will create new competitive advantages in an increasingly wider and with more foreign competitors.

CSR does not only benefit the companies themselves, but also the communities of the destinations involved, to encourage more sustainable production systems for tourism services. Thus, it appears as one of the most effective tools to help improve the quality of life in these places. In addition, improving the social conditions of employment constitutes an indirect improvement of competitiveness and market position of tourism companies located in it, both by a decrease in risk associated as a performance improvement of fate, with demand international tourism has become increasingly sensitive to the socio-political situation of potential places to visit.

On the basis of fair tourism is the traditional product enrichment by exploitation of new resources: Properly managed, it gives a potential added value generation. The extension of production capacity among local producers in turn, favours a reduction in costs, the local economic boost and improves the supply of tourism companies.

The Spanish tourism industry is under transformation towards a more competitive and sustainable, making it to highlight its transformative potential, being an activity that affects many other sectors and an important economic engine, with a notable

ability to work in poverty alleviation, local economic development and environmental conservation.

CSR in the sector is compounded by the importance that is being granted, especially among large companies, part of socially responsible indexes are perceived as indicative of a good CSR performance.

Among the main issues of CSR in the sector can be highlighted the following:

1. - Certifications and guidelines: The development of certification programs, according to international rules or standards, can help ensure the sustainability of the tourism industry. These programs have enabled companies to reduce costs, mainly those related to the environment, such as saving water and energy and waste minimization. Particularly important are the efforts by companies to prevent sexual exploitation in tourist destinations. In this regard include initiatives such as the Global Code of Ethics for Tourism or the Code of Conduct for the protection of children against sexual exploitation in tourism and travel industry.

2. - Climate change: WTO, in collaboration with the United Nations United Environment Programme (UNEP), convened in October 2007 the 2nd International Conference on Climate Change and Tourism in Davos (Switzerland). The conference stressed that the climate is an essential resource for tourism, which has a great sensitivity to the effects of climate change. It is estimated that the sector contributes 5% of global CO2 emissions. The companies have begun to respond to the challenge of climate change, acquiring a more sustainable growth model that provides for the progressive reduction of emissions of greenhouse gases (GHGs). In this line, is building a more eco-efficient transport and accommodation, to conserve natural ecosystems, which act as sinks of GHG, and customer and employee awareness about the importance of combating climate change. According to the WTO, many of the advances in climate protection will come from private sector innovation. So far, however, efforts have focused primarily on efforts to compensate for greenhouse gases.

The companies must provide in their CSR strategies binding targets to reduce emissions and develop new instruments and products that help to decouple economic growth from growth in emissions. Transparency in this regard is important for customers to choose those operators or tourism products more worry about the weather.

3. - Products and Services: The provision of fair and responsible tourism products began to gain a foothold in the sector, together with improved accessibility for people with any type of disability. Other initiatives of interest include the establishment of grant programs and NGO support, and respect for culture, religion and lifestyle of the tourist.

4. - Employees: The fair remuneration and the provision of social benefits for local employees or contractors are a central aspect of the responsibility of tourism businesses. An effective way to create a social and environmental awareness at the corporate level is the involvement of employees in social, volunteer and support to NGOs and training programs in the field and blood donation campaigns or collection of toys, food, etc.. Put a collection of tips available to the template may help to act on those aspects for improvement identified by the workers.

5. - Integration in the workplace: The hiring of disabled and disadvantaged people the purchase of goods or services to special employment centres are examples of effective practices for workplace integration. So are the training and promotion of workers from the populations of the disadvantaged social or ethnic groups or the incorporation of minorities and women equal to the workers.

6. - Local Development: To encourage the development of communities in tourist destinations is a need for co-development plans under a strict observance of human rights and social standards. Activities such as financing or partnership in social or logistical support for humanitarian aid distribution can also advance in this direction. The establishment of supply contracts with local providers allow for participation and economic activation of the communities in which the sector is present. Regarding the protection and promotion of the cultural richness of the destinations are important campaigns culturally sustainable practices, and enhancement of the intangible cultural through a range of products displayed in a respectful way of local culture.

7. - Environment: The environment is particularly important in the tourism sector as one of its main assets is the natural destination. The actions that the sector performs in relation to the environment are very different, and among them are good environmental campaigns, the development and preservation of intangible environmental targets, and project development environment friendly and efficient management of waste. The main source of pollutants in the atmosphere in the hotel industry is linked to power consumption, transforming both fuels on site, for the production of energy in power plants. Improving energy efficiency is vital to reduce the impact on the environment of tourism activities. The labelling of travel with information about your carbon footprint or ecological balance represents an effective and transparent to allow customers to choose the alternatives environmentally friendly.

In general literature, there is no immediate translation into Spanish about what a "cluster." Perhaps the term most would bring would be the business associations.

However, Clusters can be defined as "those groups of companies and organizations in a given territory, which are specialized in a certain product, service or activity, in this case tourism, and have its origin in the so-called" industrial districts. "

The concept simply means cluster agglomeration and / or proximity of companies engaged in similar or the same activity: It is a geographic concentration of interconnected companies, which have a relationship to both competition and cooperation between them.

Cluster is a word not translated literally, but it best reflects the concept of clusters of complementary and interconnected. In this way the clusters are geographic concentrations of interconnected companies and institutions operating in a particular productive activity.

Clusters affect competition in three areas: 1. Increasing productivity of associated companies 2. Indicating the direction and pace of innovation and 3. Stimulating the formation of new businesses. Regarding the last point, if a cluster is successful, it is likely to be formed chains in different directions around the core activity or base. Improving competitiveness of those found inside.

A cluster represents a radical change in traditional business culture. It is a system that includes enterprises and industries which provide functional interdependence links the development of their production processes and to obtain certain products or, in other words, a "cluster" could be defined as a set or group of companies in different sectors, located in a limited geographical area, interrelated with each other in the vertical, horizontal and collateral about markets, technology and capital are productive dynamic industrial centres, forming an interactive system that with the strong support of the Administration can improve its competitiveness.

The Spanish Tourism Plan for 2020 has several points:
1. Develop tourism benefits of the new economy: Knowledge, Innovation and Talent
2. Improve the value delivered to the customer: Perceived Quality, Spain Experiential, sell, CRM...
3. Ensuring the sustainability of Spanish tourism model: Environment, seasonal, requalification of destinations...
4. Improve the competitive framework: Accessibility, ease of administration, cooperative culture.
5. Shared leadership to promote a new tourism system.

The Spanish Tourism Plan Horizon 2020 has been launched with the objective of tourism development in Spain in the future to settle on the basis of competitiveness and environmental sustainability, social and economic.

In one of its key lines, the Customer Value includes measures to improve what is offered to the customer with travel experiences that differentiate and enhance the personality and the position of Spain as a tourist destination. This axis is divided into four separate operational programs, in which down different lines of action. Among these programs is the Perceived Quality, which promotes the improvement of the quality of tourism businesses and destinations to satisfy the expectations and needs of clients, fostering a culture of detail and customer service before, during and after travel, so as to improve the perceived quality.

In this line of action related to quality framed Hosts Project, which was created to improve the quality of businesses and destinations to properly meet the expectations of most demanding tourist. It is consistent with the line of work undertaken by the Government of Spain to assist in the preparation of business and tourist destinations so as to adapt their services to the demanding pace of market trends. It is also about fostering a series of strategies and actions that put the tourists as the focus and perspective to improve the competitiveness of our country and, therefore, in our region.

To enrich the tourist experience is necessary to implement tangible and emotional attributes of tourism products. The culture of detail, the emotional dimension of service and customer relations become differential aspects that should be strengthened through activities carried out by companies individually, and collectively, through programs run from the public-private partnerships. This same culture also becomes important with regard to space tourism, which needs to support its competitiveness in the enhancement of distinctive features and unique.

The two basic lines of action envisaged to foster a culture of detail and customer service during and after the trip, in order to improve the perceived quality as a whole are the Culture of Detail and Destiny in detail. The first includes awareness programs and training of tourism service providers in customer service. With the second is to promote the beautification of tourist destinations as a key factor, in order to positively influence the overall perception of the client

Retail Culture program aims to promote the quality perceived by tourists by improving customer service, for which we have developed a strategy to enrich the experience of tourists who visit us to promote the culture of detail, hospitality and commitment to a job well done.

Ultimately improve awareness and customer service levels of the tourism sector and local public awareness about the importance of properly addressing the customer is a challenge to get this program under Culture in Detail. It also provides tools that facilitate the improvement and awareness of the customer using two formulas. One of them is a training plan to raise and train various professionals and the other is a manual of best practices for each of the tourism sub-sectors, complemented with a self-assessment by each professional and each company can detect its drawbacks in serving their customers.

However, through the Destination program in detail, the Government seeks to improve the quality perceived by the customer from the point of view of fate. To achieve performances are designed to stimulate the adoption of best practices of beautification of tourist destinations, taking advantage of its character and uniqueness. Thus, municipalities have developed plans to rebuild streets and buildings, unique areas and recovery of the elements that are unique to the destination.

This initiative was developed through a comprehensive and coordinated strategy, improving the value offered to customer experiences that differentiate and promote the position of Spain, and Castile-La Mancha, as a tourist destination. Thus, the sector is integrated into local society, cultural heritage and the business, providing a large development of competitiveness and innovation.

In reaching the goals set, governments act with the public and private rehabilitation initiatives unfold. The planned measures

require a comprehensive and multisectoral in different areas, such as identity and image, quality of life and urban and regional systems, the key environmental sectors, opportunities in the local environment and public participation.

Through the program Destination Details are equipped with the destination managers concerned with the necessary tools to encourage the adoption of measures for the beautification of tourist destinations. In particular, spoke of a training and awareness plan, an analysis of good practice and a manual, also referred to good practice.

According to the Ministry of Industry, Tourism and Trade, in 2010 has been incorporated for the first time, a specific allocation for the creation of innovative tourism clusters. These platforms for collaboration between companies, suppliers, research and training centres and destinations managers have responded to the public announcement of this year and granted a party of 2 million euro to finance the creation and consolidation of 24 innovative clusters in the tourism sector in 14 autonomous regions.

Of note is the Association of Extremadura Tourism Cluster, the Tourism Cluster of the Balearic Islands, the Canary Islands Tourism Cluster, the Cluster de Turismo de Madrid or Catalonia Tourism Cluster, among others.

Final observations: Some Proposals and Initiatives

Among all analyzed, we found the following:

1. Network intelligence and innovation Touristic: Design of a networked system of transmission of tourism knowledge generated by various government intelligence, companies, business associations, research centres and universities through the creation of a website management and creating a tourism intelligence collaborative environment. The generation of knowledge in tourism will be effective as it gets for the highest number of representatives of different disciplines, sectors and territories involved, with the clear objective of building capacity to innovate and develop new models of service delivery and decision-making through knowledge.

2. Research, development and innovation are essential tools to compete in the global environment with growing power of customers, increased competition and strong technological development. Sensitize the entire tourism system on the impact of innovation on competitiveness.

3. People are key to the future sustainability of tourism model. It is necessary to attract, develop and retain talent within the sector with Spain Tourism scholarships or Research grants and technological innovation and the programme Advance Training that Supports for general training in telecommunications and information technology.

4. Customer Value: An Agenda for tourism policy of the Government of Spain that seeks to promote the image of Spain as a tourist destination can offer unique experiences with a high added value. It is a line of products targeting specific segments of demand, well-defined, looking for experiences with nature, unique and personalized. With one goal: To improve brand positioning Spain tourism associated with it which identifies the sub-privilegespain Spanish tourist products of higher added value. Clubs product with high potential: Encourage the creation and development of high potential tourism products aimed at market segments that are seeking differentiating attributes of the destination Spain. Product Clubs: Meeting tourism, wine routes, seasons nautical language tourism, health tourism …

5. Homogenize the "brand image" of Spain, and the level of service, contribute to a better understanding of markets and customers, or the integration of different information systems into a single database are some of the objectives of project.

6. Marketing "on line" is a technological tool for use in the integrated management of multi tourist reservations, where all stakeholders adhere to the system can manage their inventory via the internet and offering it to all tour operators and end users: Target Audience: Any supplier or intermediary services or tourism products, with special consideration to those who, by their size, can not develop their own technological tools of marketing. Advantages: online reservations, multi, single, customizable, and integrated. Objective: To provide the tourism industry a tool to facilitate the commercialization through new technologies.

7. With the aim of improving the quality perceived by tourists from Spain as a destination: Culture of Detail: Establish a strategy for customer service and shared by all tourism service providers to promote the culture of detail, hospitality and commitment with tourists who visit destinations Beautification: Develop a model of good practice in the beautification of tourist destinations: Training to transmit these values.

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Economic impact of the Deepwater Horizon Disaster on the Gulf Coast
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Abstract

An industrial accident on the oil platform Deepwater Horizon in April 2010 releasing thousands of barrels of oil daily into the Gulf of Mexico for more than three months before being capped in August. The oil disaster impacted Gulf Coast fisheries, tourist activities, and industrial activities across the region and led to the imposition of a short term moratorium on drilling in the region. This paper evaluates the short run economic impact of this disaster on the Gulf Coast economy. Results of the analysis are mixed indicating an overall limited impact on sectoral employment from the disaster.

Introduction

On April 22, 2010, a malfunction of critical equipment on the offshore oil drilling platform Deepwater Horizon led to the death of 11 workers and what was to become the largest oil spill in U.S. history. Over the next four months, the well leaked thousands of barrels of oil into the Gulf of Mexico daily – while the specific amount has been debated for many months, the final amount of oil spilled into the Gulf has been estimated to be in excess of 4.9 million barrels.

The Gulf region of the U.S. is no stranger to disasters and is regularly struck by geophysical events such as hurricanes and tropical storms annually. Technological disasters on the scope and scale of the BP-Deepwater Horizon event are relatively rare and pose some unique challenges. Unlike the natural hazards that residents, government authorities, and regional planning authorities have come to expect and incorporate into their planning horizons, manmade technological disasters may not be as readily accounted for in the planning process. While the initial proximate causes of these types of event appear to be directly under the control and influence of the various economic agents, e.g. firm managers, individuals such as ship captains and truck drivers, and government officials, each event arises from a unique set of circumstances leading to an equally less predictable set of possible outcomes.

Events such as the 1978 Amoco Cadiz oil spill in 1978, the 1989 Exxon Valdez oil spill, or the 2002 Prestige oil spill off the coast of Spain have all had their impact on policy formation at the country, region and international level. The Valdez accident led to the writing and passage of the Oil Pollution Act (OPA) of 1990 establishing the basis for current policy in the United States for response and liability arising from oil spills in coastal waters. How policymakers, government authorities and individual economic agents operate, oversee, and regulate the set of activities that could give rise to these types of events is a matter of important concern – not only with regard to the inherent dangers from an oil spill, but also with regard to the whole range of activities surrounding the industry, from the conduct of firms and individuals in the region, to the greater set of regional, national, and international economic linkages.

In the months following the event, tourism in the region plummeted, fishing fleets were idled, and a temporary moratorium on off-shore exploration was put in place. While cost estimates and potential liabilities of the Deepwater Horizon spill led BP to agree (with the U.S. government) to establish a $20 billion compensation fund to pay out claims to the thousands of affected individuals and firms in the region, the overall impact on the Gulf's regional economy or the national economy has still not been fully evaluated. This paper evaluates the economic impact of the BP oil spill on the regional and national economy.

Gulf oil, spills and economic impact

Approximately 90 percent of the US's offshore crude oil, 13% of its natural gas, and 33% of its seafood production originates in the Gulf of Mexico (Department of the Navy 2010). A study by Iledare et al (1997) evaluated the risk of increased oil spills or workplace safety issues associated with the increasing number of independent drilling platforms in the Gulf. They did not find that independents were less safe than major producers, and also did not find an increase in the number of offshore platform accidents as a result of the rising number of independents. A more recent study by Kaiser, Dismukes and Yu (2009) found that disruptions to production and storm damages to equipment and infrastructure from the 2004-2005 hurricane seasons resulted in a loss of 60-65 million barrels of oil, 266 billion cubic feet of gas, and the acceleration of

mature assets being written off. Hahn and Passell (2010) in their evaluation of allowing more US oil drilling find that an increase in offshore drilling would have a 1 percent impact on world oil prices.

Beamish (2001; 2002) addresses managerial and institutional failures that occurred in the context of the Guadalupe Dunes oil spill, an on-shore oil spill that transpired over a 38 year period from 1952 to 1990. What initially started as minor leaks from an onshore petroleum facility of diluent, a type of petroleum thinner, which were ignored and not addressed by appropriate maintenance and repairs, resulted in the leakage of 20 million gallons into a 6 square mile area of wetlands and sand dunes. The problem was not addressed by federal and state oversight authorities or Unocal the firm operating the oil field until oil began to wash up on the San Luis Obispo beaches in 1990. The Coast Guard was one of the first authorities to respond to the disaster in accordance with the OPA. As with the BP accident in 2010, responses included the use of dispersants to try and prevent oil from building up on the beaches despoite the potentially harmful effects that they may have. The first study (Beamish 2001) finds an increase in public distrust of both big business and outside regulators by local residents in response to the failure of either Unocal or regulators to rein in the behavior that took place over such a long period of time and in their responses to the disaster itself once it became apparent that the problem existed. The latter study (2002) more directly addresses the organizational failures that arose out of the overlapping jurisdictions of state and federal authorities, first responders, and Unocal in causing and responding to the spill.

Evaluating the economic impacts of any disaster presents a number of unique challenges. Cochrane (2004) points out a number of problems that may arise in the process of estimating economic losses including the issues of double-counting, evaluating post-disaster liabilities (especially in the case of manmade events), problems with modeling indirect and systemic losses, and evaluating the effects on economic growth from changes in long-term indebtedness that arise as a result of borrowing to finance recovery and reconstruction. He establishes an accounting framework for regional and national level evaluation. This accounting framework essentially sums up the direct, iconic, environmental, interindustry, and postponed impacts, and subtracts any offsets such as rebuilding stimuli financed by insurance and federal aid (for regions), survivor benefits, unemployment compensation, and recaptured lost production services that may arise in other parts of the region. Similarly, national level costs are calculated by taking net regional losses and adding back in costs that were incurred outside of the region (federal aid for example), bottleneck costs, systemic indirect losses (financial industry and institutional costs), and subtracts benefits that transferred outside of the region, such as recaptured production in some other part of the country.

There are a number of difficulties in evaluating the costs and impact of oil spills. Griglunas et al (1986) in evaluating the costs of the Amoco Cadiz spill off the coast of Brittany in 1978 raised two particularly important issues – estimating the costs of military assistance for clean-up, and accounting for the costs of lost wildlife and the value of assisting wildlife in the post spill period. One difficulty that they faced in particular in evaluating fishing industry losses was the unavailability of regional fishing catches. They defined costs in terms of clean-up costs and opportunity costs of resources. They also pointed out that damage liabilities act like a tax and influence the behavior of the economic agents involved.

Liu and Wirtz (2006) address some of these same themes in their analysis of the costs associated with oil spills. Their analysis comments upon five cost areas, environmental, socio-economic, clean-up, research, and other expenditures. Of the five, they point out that monetary costs of environmental damages are not readily assessable and require the use of various constructed or surrogate valuation methodologies such as contingent valuation, or travel cost to develop and measure the cost of lost environmental services. In a follow-up paper, Wirtz et al (2007) evaluate the impact of the Prestige oil spill incorporating uncertainty into a contingency simulation model. Their model looks at three potential cost areas resulting from the initial impact – loss of income, environmental damage, and residual risk.

Cohen (1995) in evaluating the impact of the Exxon Valdez oil spill focuses upon an evaluation of the disaster's social cost in the context of a market model. In particular, the paper estimates the disaster's impact upon the fishing industry and economy using ex post forecasts of lost catch. Similarly, Heen and Andersen (1994) using an input-output model (I/O) for northern Norway, estimate the costs of a simulated oil spill from offshore oil rigs upon aquaculture and the fishing industries. They find that depending upon the level of severity of the spill aquaculture and fishing related income may suffer severe reductions for up to three years.

Laureiro et al (2006) estimate the socio-economic costs of the Prestige oil spill using a straight accounting procedure. Losses from each sector such as lost catches and lost tourism are calculated and totaled. This process results in providing an estimate of short-term regional costs. Garza-Gil, Prada-Blanco, and Vazquez-Rodriguez (2006) follow a similar procedure to estimate the economic damages from the Prestige event. Their analysis estimates both short and medium term costs of the spill and finds that when social damages are taken into account, current Spanish and international compensation schemes did not fully cover the costs. In a more recent study, Laureiro, Loomis and Vazquez (2009), instead of evaluating the economic impact of the oil spill, conducted a contingent valuation analysis of the disaster on Spain, estimating the mean willingness to pay of Spanish citizens to avoid oil spills as well as an overall societal valuation of the cost of the disaster.

Carson et al (2003) is a contingent valuation study of the Exxon Valdez spill and focuses upon estimating the costs of lost passive use. The paper provides an overview of the survey and procedures that were used to evaluate lost passive use from a survey that was given to a national sample of households to ascertain willingness to pay to prevent another oil spill.

The study is important in the context of the legal case that followed the oil spill lost passive use is recognized by the OPA and the courts have ruled that passive use value is compensable.

Studies such as those by Baade, Baumann and Matheson (2005), and Vogel and Veeramacheneni (2003; 2004) utilize econometric methods to evaluate the impacts of disaster events on regional economic activity. In the case of Baade, Baumann and Matheson, they use an ARIMA model to evaluate the disaster effects in conjunction with an intervention analysis on both Hurricane Andrew (Miami) and the Rodney King riots (Los Angeles) to evaluate disaster impacts with a focus on developing recovery strategies for post-Katrina New Orleans. Vogel and Veeramacheneni also use an autoregressive intervention analysis, however their focus is upon regional impacts of hurricanes and tropical storms in the Southern United States. The analysis of the BP oil spill presented in the next section of this paper similarly uses an autoregressive intervention analysis to assess the overall impact on employment and economic activity in the Gulf region as a result of the disaster. The analysis is still preliminary given that recovery in the region is still ongoing.

Preliminary analysis of Deepwater Horizon

Preliminary analysis of the regional impacts of the disaster is based upon an evaluation of regional sectoral employment. In particular, I focus upon three sectors – leisure employment, agriculture, and mining. The disaster occurred just as the Gulf Coast region was entering its prime tourist season, and news reports from May through early August continually reported upon oil washing ashore onto beaches from Panama City, Pensacola, Gulf Shores, and throughout the region and the concomitant impact upon tourism (Department of the Navy 2010). Given the possibility that individuals and families that had planned upon vacationing somewhere along the Gulf coast, hotels, restaurants, and other leisure related services may have reduced employment or otherwise not hired as many seasonal workers as usual.

One of the hardest hit sectors was the fishing industry. Given the scope of the oil spill, commercial and sports fishing activities throughout the region were virtually shut down for close to 4 months. Regulatory officials continue to monitor the region for adverse effects and contamination from the oil. Long term impacts on stock, from oysters and shrimp to the many commercially harvested breeds of fish are still being evaluated. While a significant portion of the labor employed in these pursuits may have found alternate employment in the ensuing clean-up, the agricultural sector (which also encompasses the fishing industry) may have suffered adverse employment impacts through the crisis.

The spill also led to a four month moratorium on off-shore exploration and drilling for oil and natural gas in the region. While the labor force and firms engaged in these activities are primarily based out of Louisiana and Texas, they may also draw upon resources throughout the region. Disaggregated data on employment in oil and gas employment is available for Texas and Louisiana, with data for Texas available from 1990 to the present, but only from 2003 to the present for Louisiana, but not for the 3 other Gulf states. In order to utilize a longer time series and assess the impact for the region as a whole, the whole mining sector which also encompasses oil and natural gas is used.

Following Baade et al (2005) and Vogel and Veeramacheneni (2003l; 2004) the oil spill's impact on regional sectoral employment is evaluated using an autoregressive model as follows:

$$\text{Emp}_i = \beta 0 + \beta_1 X_t + \beta_2 \text{TimeTrend} + \beta_3 AR(1)_t + \beta_3 \text{Event}_t + \mu, \tag{1}$$

where,
> Emp_i = sectoral state employment,
> X_t = national variables affecting state employment such as real GDP and GDP growth,
>   and
> Event_t = a dummy variable equal to '1' during the oil spill, and '0' otherwise.

The equation is estimated as an ARMA model in log form. The equations are estimated in both level and first difference forms to account non-stationary issues detected in the variables and also include a time trend. Given the paucity of data specifically for the oil and gas sectors, two individual equations are estimated for Louisiana and Texas.

Data for the analysis includes monthly and quarterly sectoral employment from the "Current Employment Survey" 1990 to 2010 and "Quarterly Census of Employment and Wages" 1910 to 2010 from the Bureau of Labor Statistics (Leisure, Agricultural, Mining, and Oil and Gas), and real gross domestic income from the National Income and Product Accounting (NIPA) tables. The equations are estimated both individually for each state and as a panel for the entire region. Seasonally adjusted employment data was used in the analysis of the Leisure sector so as to better capture the effects of the disaster.

A priori, I would predict that the coefficients for GDP and lagged employment would be positive. It is harder to predict the sign of the event coefficient. For leisure employment, while presumably, a decrease in tourism (and reduced incomes in fisheries and mining industries from reduced output) would result in a reduction in sectoral employment, it is possible that there may be an influx of labor to help clean-up the spill – resulting in tourists being replaced by short-term clean-up crews – or in other words, a silver-lining effect. It may be possible that we see this occur in the mining or oil and gas sector as well.

Results of the Analysis

As expected, signs for the coefficients for both level and differenced values of the coefficients were overall as predicted (Tables 1-3). The impacts on employment of the oil spill in the three different sectors are more difficult to ascertain. In the case of the leisure sector (Table 1), employment in both Alabama and Florida show a positive and significant coefficient, while for the other three states, the impact is negative, but not significant. Given the overall size of Florida's tourism and leisure industries, this may simply represent a shift of tourists away from the Northwest Florida Gulf coast destinations such as Pensacola Beach, and movement towards other parts of the state. In the case of Alabama, there were numerous news reports of the downturn in tourism along coastal portions of the state, but again on a statewide basis, tourists may have found other destinations. For Mississippi, Louisiana, and Texas, the coefficient was negative, but not significant, which suggests that the event had only limited impact on this sector.

Table 1: Regression Results of Leisure Sector Employment (dependent variable)

Variable	Level	Standard Error	1st Difference	Standard Error
Constant	1.87***	0.726	0.002***	0.0004
USGDP	0.514***	0.111	0.374***	0.083
Time Trend	0.0001	0.0004	-.000009***	0.000002
AR(1)	0.99***	0.003	0.059**	0.029
Oil Spill Dummy-AL	0.024***	0.004	0.005**	2.492
Oil Spill Dummy- FL	0.008**	0.004	0.005***	0.0019
Oil Spill Dummy-LA	-0.007	0.013	-0.0019	0.005
Oil Spill Dummy-MS	-0.001	0.012	0.0016	0.005
Oil Spill Dummy-TX	-0.006*	0.003	-0.0009	0.001
Constant-AL	-0.672		-0.00012	
Constant-FL	0.970		-0.001	
Constant-LA	-0.496		-0.00012	
Constant-MS	-0.873		0.0010	
Constant-TX	1.071		0.0002	

*0.10 level of significance **0.05 level of significance   ***0.01 level of significance

In the case of the agricultural sector (Table 2), the regressions did not provide much insight. Given the limited overlap between the start of the disaster and the overall employment data for this sector which ended in June, it is difficult to draw any conclusions from these regressions. Aquaculture, which includes fishing and similar activities, is only a small portion of this sector and separate employment data for the sector was not available. Data for landed catch also was not available for 2010, as all of the official series ended in 2009 at the time of this writing.

Table 2: Regression Results of Agriculture Sector Employment (dependent variable)

Variable	Level	Standard Error	1st Difference	Standard Error
Constant	5.280***	1.63	0.0001	0.004
USGDP	0.580***	0.179	0.394	0.295
Time Trend	-0.003***	0.0003	-0.000014	0.000021
AR(1)	0.824***	0.234	-0.0787*	-1.846
Oil Spill Dummy-AL	0.0225	0.0184	0.009	0.006
Oil Spill Dummy- FL	0.050***	0.0184	0.0255*	0.014
Oil Spill Dummy-LA	0.004	0.0184	0.0003	0.012
Oil Spill Dummy-MS	0.001	0.0184	0.002	0.0122
Oil Spill Dummy-TX	0.007	0.0184	0.005	0.008
Constant-AL	-0.674		-0.0000994	
Constant-FL	1.242		-0.00024	
Constant-LA	-0.877		-0.00038	
Constant-MS	-0.564		-0.00033	
Constant-TX	0.875		-0.00105	

*0.10 level of significance **0.05 level of significance   ***0.01 level of significance

Table 3: Regression Results of Mining/Oil Sector Employment (dependent variable)

Variable	Level	Standard Error	1st Difference	Standard Error
Constant	-119.09	2327.26	-0.0037***	0.0013
USGDP	0.388*	0.216	0.0439**	0.2248
Oil price(-1)	0.009**	0.004	0.0079*	0.0045
Time Trend	0.039	0.410	1.63E-05**	8.28E-06
AR(1)	1.196***	0.030	0.1572***	0.0306
AR(2)	-0.196***	0.0303	0.1447***	0.0305
Oil Spill Dummy-AL	-0.018**	0.007	-0.0025	0.0063
Oil Spill Dummy- FL	-0.022**	0.009	-0.0091	0.0075
Oil Spill Dummy-LA	0.003	0.009	-9.02E-05	0.0077
Oil Spill Dummy-MS	-0.00007	0.014	0.0048	0.0118
Oil Spill Dummy-TX	-0.010	0.006	0.0096*	0.0053
Constant-AL	-3.956		-0.0011	
Constant-FL	-10.48		-0.0025	
Constant-LA	1.634		0.0003	
Constant-MS	-0.948		-8.92E-05	
Constant-TX	7.677		0.0019	

*0.10 level of significance **0.05 level of significance   ***0.01 level of significance

Estimated coefficients for the mining sector overall are as predicted. GDP and lagged oil prices had a positive and significant impact on sectoral employment for both the level and first differenced regressions. The time trend was positive, but only significant for the first differenced equation. The oil spill appears to have led to a drop in mining sector employment for both Alabama and Florida that was significant in the level estimation (but not in first difference form). In the case of Texas, it appears that there was a positive and significant impact stemming from the event on employment in this sector.

Conclusions

It is important to keep in mind that with the establishment of the compensation fund over the summer of 2010, funded beyond the statutory limitations, many of the affected individuals and firms in the region will receive (and a number have already received) some level of compensation. As was noted elsewhere in this paper though, it is likely that there will be some amount of uncompensated losses. Of course it is always subject to debate and evaluation as to what is a fair level of compensation especially when trying to estimate lost revenues and income from business interruption.

While ideally, other indicators of economic activity such as sales tax revenues, actual regional tourism, income, and other similar measures would also prove valuable to assess. The results from this analysis are still preliminary in nature and over the next few months, and I do intend to evaluate these additional areas as more data becomes available.

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Empirical Investigation into the Efficiency of the Gold Market: An Application of the Threshold Unit Root Techniques

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Abstract

This paper examines the efficiency of the gold market using the two-regime threshold autoregressive (TAR) unit root procedures proposed by Caner and Hansen (2001). The results from the Wald tests suggest the null hypothesis of linearity should be rejected in favor of the alternative that there is a threshold effect in the gold return series. The results from the TAR unit root tests indicate that the gold return series are partial unit root processes as non-stationarity was found in only one of the two regimes. The results indicate that the gold market is weak-form efficient for most part of the study period.

Introduction

This paper examines the efficiency of the gold market using the two-regime threshold autoregressive (TAR) unit root procedures proposed by Caner and Hansen (2001). The issue as to whether or not gold return exhibits a random walk behavior is important to investors who seek to exploit the opportunities created by inefficiencies in gold markets. If gold returns are characterized by random walk behavior, it then follows that shocks to returns are permanent. This implies that future movements in gold returns cannot be predicated using historical data. However, if gold returns are not random walk processes, then future movements in the return series can be predicated using historical data.

The motivation for this study stems from the rapid increases in gold prices for the past five years. For example, the price of gold in October 2005 was $456.05 per ounce (based on London p.m. fix). However, the price rose to $1342.02 in October 2010. This represents an increase of approximately 194.27 percent in the price of gold per ounce. Figure 1 plots gold price per ounce from January 1971 through October 2010. From the graph, it can be seen that the price of gold has fluctuated over the years. However, one cannot help but to notice that the price of gold has markedly trended upward between January 2005 and October 2010.

A number of studies have examined the random walk behavior of financial time series including foreign exchange, stock market and gold market returns. For instance, Cheung and Lai (1993) using the modified rescaled range (R/S) procedure examined the long memory properties of gold market returns. They found evidence of long memory for the full sample spanning the time period July 1973 through December 1987. However, when the sample period was divided into two, they found that the long memory behavior exhibited by gold returns is unstable. Alptekin (2008) investigated the long memory properties of gold market returns for Turkey using both the classical rescaled and modified rescaled range techniques. The results from both the classical rescaled and modified rescaled range procedures reveal that gold returns display persistence dependence. Mehrara, et al. (2010) examined the efficiency of gold market using the neural network procedures. They find that gold market is inefficient and therefore conclude that profitable trading opportunities exist in the gold market.

Aggarwal and Soenen (1988) examined the efficiency of the gold market using daily price changes on the London bullion market for the period 1973-1982. They find that the gold market was inefficient and therefore concluded that there was no easy way to exploit gold market inefficiency to generate extraordinary returns, especially in the presence of transaction costs. They further found that the beta coefficient for gold was small and positive. They interpreted this finding as evidence of risk-reducing property of gold and its desirability for portfolio diversification. Solt and Swanson (1981) examined the efficiency of the markets for gold and silver. They found that there is evidence of considerable heteroscedasticity in the variances of the price changes for the metals except for the logarithmic price change series. They also found that the means of the price change series for gold and silver are nonzero and not stationary. Based on these findings they concluded that investors cannot easily use the positive dependence present in the data to generate superior returns.

Figure 1: Gold Price, USD Per Ounce (London PM Fix)
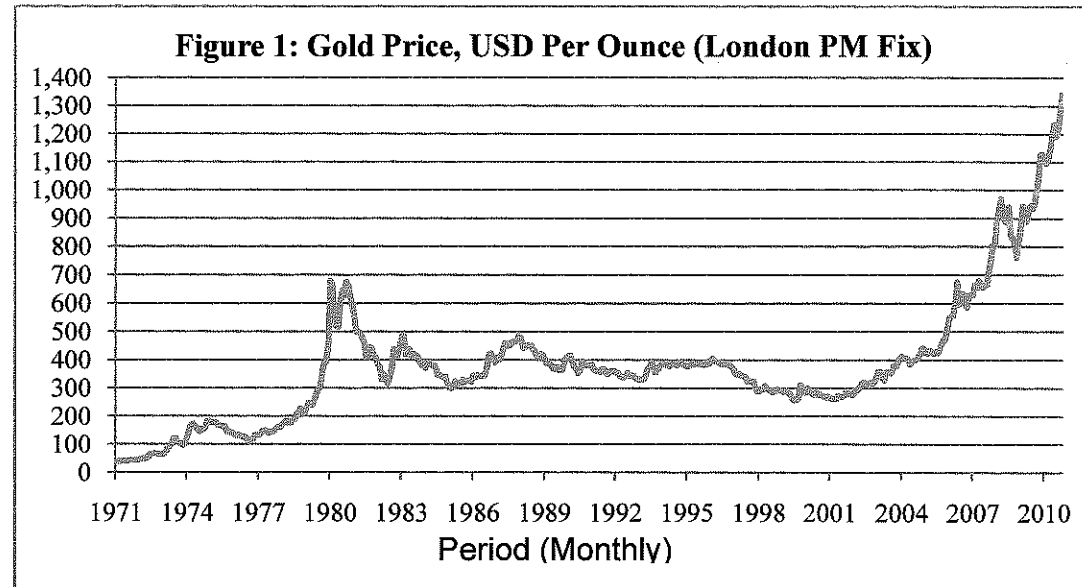
Wright (2000) using ranks and signs tests reject the notion that exchange rate returns are random walk processes for the United States. In contrast, Belaire-Franch and Opong (2005) using the nonparametric variance-ratio tests find evidence in support of the hypothesis that Euro exchange rate returns exhibit random walk behavior. Chang (2004) utilizing the variance-ratio tests reexamined the random walk hypothesis for Canadian dollar, French franc, Deutsche mark, Japanese yen, and the British pound for period August 7, 1974 through December 30, 1998. The results for the full sample reject the null hypothesis that exchange rate returns for the sample countries follow random walks. However, the results for the sub-period 1989 through 1998 fail to reject the null hypothesis that exchange rate returns for the Canadian dollar; French franc, Deutsche mark, and the British pound are random walk processes.

Liu and He (1991) utilizing the standard variance-ratio tests find that the Canadian dollar, French franc, Deutsche mark, and the British pound are not random walk processes. Other studies including Giddy and Dufey (1975), Cornell and Dietrich (1978), Logue et al. (1978), and Hsieh (1988) suggest that exchange rates exhibit random walk behavior. Based on this finding, they conclude that movements in exchange rates cannot be predicated using past information. Chen and Jeon (1998) applying the variance-ratio and the regression test investigate the random walk behavior of exchange rate returns. They find that exchange rate returns exhibit random walk behavior.
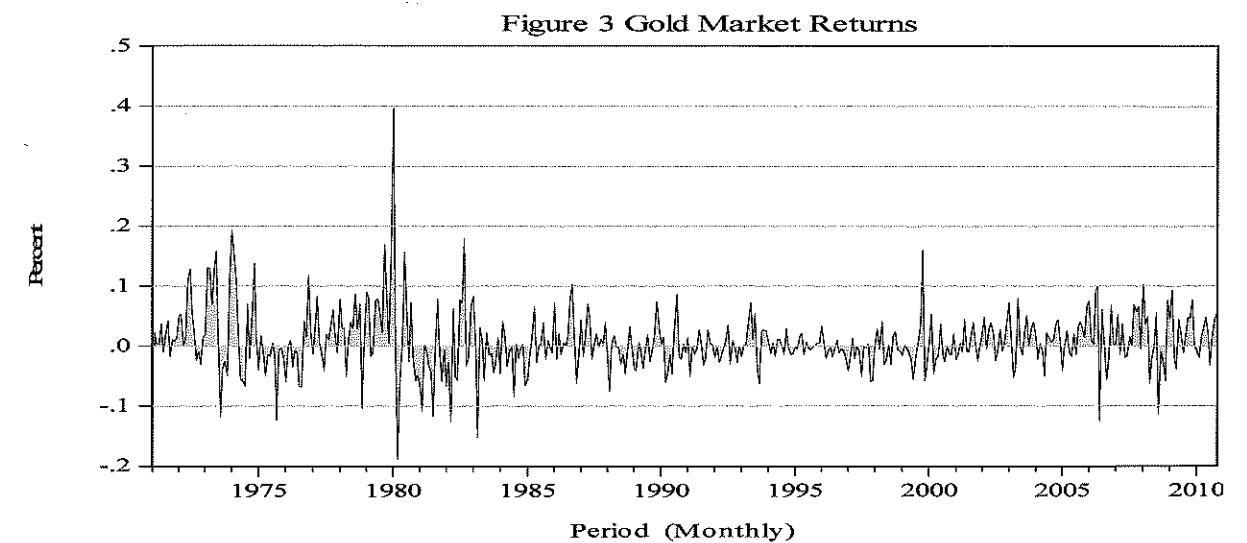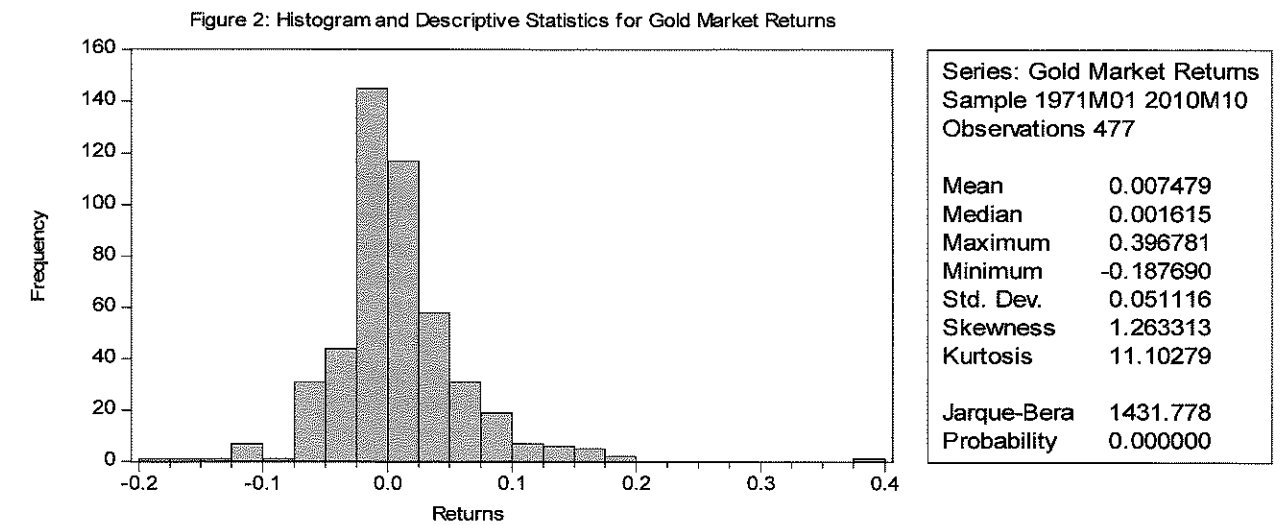
From the preceding cited studies, it is clear that the efficiency of the gold market has not received adequate attention in the literature. Unlike most of the earlier studies that used the standard unit root and variance ratio tests, the present paper applies the threshold autoregressive (TAR) model proposed by Caner and Hansen (2001). The TAR model has a number of advantages over the standard unit root tests. It is capable of simultaneously capturing nonstationarity and nonlinearity in the data. In addition, the TAR model allows testing for a partial unit root process in two regimes.

The reminder of the paper is structured as follows. Section 2 furnishes the methodology. Section 3 presents the data and the summary statistics. Section 4 discusses the empirical results. Section 5 provides the conclusions and the policy implications of the study.

Data and Summary Statistics

The data on monthly gold prices were retrieved from the World Gold Council website at http://www.research.gold.org/prices/. The data span the time period January 1971 through October 2010. The return series are calculated by taking the first differences of the logarithms of gold prices [i.e. $rt = \ln(Pt) - \ln(Pt-1)$]. Figure 2 presents the histogram and the summary statistics for gold market returns. The mean and median returns are approximately 0.007479 and 0.001615 percent. The market risk measured by the standard deviation is 0.051116 percent. The maximum and minimum values are 0.396781 and -0.187690 percent. These values indicate that gold market returns fluctuated over the years. The skewness (1.263313) is positive suggesting that the upper deviations from the mean are larger than the lower deviations. This finding indicates that there is a greater probability of large increases than decreases in gold market returns. The Kurtosis coefficient (11.10279) is greater than 3 suggesting that the normality assumption relative to the distribution of gold market returns should be rejected. Similarly, the Jarque-Bera test statistic (1431.778, pv=0.0000) is statistically

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significant at the 1 percent level. Taken together, the Kurtosis and the Jarque-Bera statistics the gold market returns are characterized by much higher distributions than the normal distribution. The histogram corroborates the finding gold market returns are not normally distributed. Figure 3 plots gold market returns. The graph reveals lack of trend in the return series. In essence, the graph reveals the volatile nature of gold market returns.

Figure 2: Histogram and Descriptive Statistics for Gold Market Returns

Series: Gold Market Returns	
Sample 1971M01 2010M10	
Observations 477	
Mean	0.007479
Median	0.001615
Maximum	0.396781
Minimum	-0.187690
Std. Dev.	0.051116
Skewness	1.263313
Kurtosis	11.10279
Jarque-Bera	1431.778
Probability	0.000000

Figure 3 Gold Market Returns

Methodology

The TAR unit root procedure adopted by the study follows the seminal work of Caner and Hansen (2001). The mathematical expression of a two regime TAR model of order k is given by:

$$\Delta y_t = \theta_1 x_{t-1} I_{(Zt-1,,<\lambda)} + \theta_2 x_{t-1} I_{(Zt-1\geq\lambda)} \varepsilon_t \qquad (1)$$

$$\text{with } x_{t-1} = (y_{t-1}, I, \Delta y_{t-1}, ..., \Delta y_{t-k})' \qquad (2)$$

where y is the variable of interest (in our case gold returns) for t, 1,2, 3, ...,T, εt represents an i.i. d. error term; I(*) is the indicator function that assumes the value of 1 if the expression (*) is true and 0 otherwise; $zt= yt - yt-m$ for some $m \geq 1$ m represents the threshold variable, and $k \geq 1$ stands for the autoregressive order. Zt acts as the return at time horizon of m months. The optimal delay order is selected so that it minimizes the residual variance for the TAR model of each deviation

series. The threshold parameter is given by λ. λ assumes values within the interval $\lambda \, \varepsilon \, \Lambda = [\lambda 1, \lambda 2]$, where $\lambda 1$ and $\lambda 2$ are selected according to $\rho(zt \geq \lambda 1) = \pi 1 > 0$, and $\rho(zt \leq \lambda 2) = \pi 2 < 1$. The components of $\theta 1$ and $\theta 2$ are given by the expressions:

$$\theta_1 = \begin{pmatrix} \rho_1 \\ \beta_1 \\ \sigma_1 \end{pmatrix} \quad \text{and} \quad \theta_2 = \begin{pmatrix} \rho_2 \\ \beta_2 \\ \sigma_2 \end{pmatrix} \tag{3}$$

where $\rho 1$ and $\rho 2$ represent the slope coefficient on yt-1, $^{\beta 1}$ and $^{\beta 2}$ are scalar intercepts, while $\sigma 1$ and $\sigma 2$ are k x1 vectors containing the slope coefficients on dynamics regressors (Δyt-1, ------,Δyt-k) in the two regimes. To calibrate equation (1), the concentrated least squares technique (LS) is usually applied. For each $\lambda \, \varepsilon \, \Lambda$, equation (1) is estimated by means of ordinary least square (OLS) such that:

$$\Delta y_t = \hat{\theta}_t(\lambda)' x_{t-1} I_{(Zt-1,,<\lambda)} + \hat{\theta}_2(\lambda) x_{t-1} I_{(Zt-1\geq\lambda)} \hat{\varepsilon}_t \tag{4}$$

Let $\hat{\sigma}^2(\lambda) = T^{-1} \Sigma_1^T \hat{\varepsilon}_t(\lambda)^2$ represents the OLS estimate of $\sigma 2$ for fixed λ. The LS estimate of the threshold parameter (λ) is obtained by minimizing the residual variance, $\sigma 2(\lambda)$:

$$\hat{\lambda} = \arg\min_{\lambda=\Lambda} \hat{\sigma}^2(\lambda) \tag{5}$$

Two issues generally arise in estimating the TAR model of equation (1). The first is whether or not the threshold is present in the data. The second issue is whether the series y (in our case gold returns) is a unit root or stationary process. To test for the presence of threshold effect, the study implements the Wald test introduced by Caner and Hansen (2001). The Wald test is given by the following expression:

$$W_T = W_T(\hat{\lambda}) = \sup W_T(\lambda) \tag{6}$$

The null hypothesis no threshold effect (linearity) is tested against the alternative of threshold effect (nonlinearity). The null hypothesis (H0) involves testing that the R1two vectors of coefficients are equal between the two regimes (i.e. $\theta 1 = \theta$). The rejection of the null hypothesis indicates the presence of threshold effect and hence nonlinearity in the data. Caner and Hansen (2001) proposed a bootstrap method to calculate the asymptotic critical values and the p-values.

The stationarity of the process yt is dependent on the two parameters $\rho 1$ and $\rho 2$. In regime 1, the null hypothesis that yt is a unit root process is rejected in favor of the stationarity alternative if the parameter $\rho 1$ is statistically different from zero. Similarly in regime 2, the null hypothesis that y is a unit root process is rejected if the parameter $\rho 2$ is statistically different from zero. If the null hypothesis that $\rho 1$ equal to $\rho 2$ (i.e. Ho: $\rho 1 = \rho 2 = 0$) is not rejected, yt is a unit root process. If on the other hand, the alternative hypothesis Ho: $\rho 1 < 0$ and $\rho 2 < 0$ holds true, then yt is a stationary process in both regimes. In additional to testing stationarity simultaneously in both regimes, it is also possible to test for intermediate partial unit root. The partial unit root test involves testing H2: $\rho 1 < 0$ and H2: $\rho 1 = 0$ or $\rho 1 = 0$ and $\rho 2 < 0$. The alternative hypothesis is $\rho 1 \neq 0$ or $\rho 1 \neq 0$. The acceptance of the null hypothesis implies that the series yt is a unit root process in one regime and stationary in the other regime.

The null hypothesis of the partial unit root is tested against the alternative through the Wald statistic. The Wald test is based on the following expression:

$$R_{2T} = t_1^2 + t_2^2 \tag{7}$$

where t_1 and t_2 represent the t-ratios associated with ρ_1 and ρ_2, respectively from the OLS regression.

Caner and Hansen (2001) point out that the two-sided Wald test of equation (7) may have less power than a one-sided version of the test. To this end, Caner and Hansen recommended the application of the one-sided Wald test. The one-sided procedure is given by the expression:

$$R_{1T} = t_1^2 I_{(\rho 1 < 0)} + t_2^2 I_{(\rho 2 < 0)} \tag{8}$$

The null hypothesis is tested the alternative $\rho_1 < 0$ and $\rho_2 < 0$. The null hypothesis of a unit root is rejected in favor of the alternative if the test statistic R_{1T} is statistically significant. Unfortunately, the test does not discriminate between the stationarity case H_1 and the partial unit root case H_2. To mitigate this weakness, it is recommended that the researcher should examine the individual *t* statistics including t_1 and t_2. The series y_t is stationary in regime one if the t-statistic t_1 is negatively significant from zero (-t_1). Similarly, the series y_t is stationary in regime two if the t-statistic t_2 is negative and statistically different from zero (-t_2). The finding of stationarity in only one of the two regimes would providence evidence of partial unit root.

Empirical Results

This section discusses the empirical results of the study. Prior to applying the TAR model, the study first implemented the augmented Dickey-Fuller unit root test. The ADF unit root test results are presented Panel A of Table 1. The results indicate that the null hypothesis of a unit root should be rejected for the gold return series. In each case, the test statistic exceeded the critical value at least at the 5 percent significance level. However, these results should be interpreted with caution given that the standard ADF unit root procedure is designed to test the existence of linear unit roots against linear stationarity and hence lacks the ability to discriminate nonstationarity from nonlinearity.

We would be drawing biased inferences from the ADF test results if indeed gold market returns were nonlinear processes. After all, a number of studies including Hsieh (1991) and Savit (1988) have argued that many financial time series tend to be nonlinear processes. Taylor et at (2001) suggested that exchange rates might follow a nonlinear path over time. In addition, Maki (2010) suggests that many economic time series undergo regime shifts and structural breaks as a result of wars, political changes, shocks, and the relationship between cost and yield (Maki 2010, pp. 1). To account for the likelihood that the gold return series are nonlinear processes, the study applies the two-regime TAR unit root model. The results from the TAR model are presented in Panels B through D Table 2. Panel B displays the threshold test results. The Wald test statistics (WT) are 51.80 (p-value=0.000) and 32.60 (p-value =0.040), respectively for actual and absolute returns. The Wald statistics were maximized when the delay parameter (m) was 3 for actual and absolute returns. Since the bootstrap p-values associated with the various return measures are less than 5 percent, we reject the null hypothesis that the gold return series are linear in favor of the alternative that there is a threshold effect in the data. These results indicate that the gold return series are nonlinear and justify the application of the TAR model. This finding implies that the standard autoregressive model (AR) should be rejected in favor of the TAR model.

Given that the gold return series are determined to be nonlinear processes, the study next calculates the one-sided and two-sided threshold unit root test statistics R1T and R2T and their respective bootstrap p-values. The test statistics for R1T and R2T threshold unit root procedures are presented in Panel C of Table 1. The results for the two-sided threshold unit root procedure suggest that the null hypothesis of a unit root in the gold returns should be rejected at the 1 percent level of significance. The calculated test statistics 121.00 and 42.20, respectively for actual and absolute returns are all statistically significant at the 1 percent level, as indicated by the bootstrap p-values. Similarly, the results for the one-sided threshold unit root procedure reveal that the null hypothesis of a unit root in the gold returns should be rejected at the 1 percent level of significance. The computed test statistics for actual returns (119.00) and absolute returns (40) are statistically significant at the 1 percent level. Taken together, the results from both the one-sided and two-sided threshold unit root tests suggest that the gold return series are stationary processes.

One of the disadvantages of the one- and two-sided threshold unit root tests is their inability to differentiate full unit root from partial unit root. To this end, we examine the stationarity of the two regimes individually using the partial unit root tests. The t1 and t2 test statistics and their bootstrap p-values are presented Panel D of Table 1. For regime 1, the test statistics (t1) -1.45 (p-value=0.71) and -1.21 (p-value=0.80), respectively for actual and absolute returns are not statistically significant at the conventional levels. These results indicate that the gold return series are not stationary in regime 1. Turning next to regime 2, the test statistics (t2) 10.90 (p-value = 0.00 and 6.38 (p-value=0.00), respectively for actual and absolute returns are statistically significant at the 1 percent level. From these results we surmise that the gold return series are stationary processes in regime 2. The finding of stationarity in only one regime suggests that the gold market is at some times weak-form efficient.

The threshold parameters ($\hat{\lambda}$) are reported in Panel B of Table 1. The TAR model divides the data into two regimes depending on whether the threshold variable lies above or below 0.09 and 0.06 respectively for actual and absolute returns. For actual returns, regime 1 occurs when ZT < 0.09. This implies that regime 1 occurs when gold returns fall below 9 percent over a 3 month period. For absolute returns, the threshold estimate of 0.06 implies that regime 1 occurs when ZT < 0.06. This indicates that regime 1 when gold returns fall below 6 percent within 3 months. The number of observations that fall within regime 1 for both actual and absolute returns is 399. That is 84.7 percent of the total observations. On the other hand, 15.3 percent (72) of the observations fall within regime 2.

Summary

This paper has used the two-regime TAR model advanced by Caner and Hansen (2001) to examine the efficiency of the gold market for the period spanning January 1971 to October 2010. The TAR model is preferred over the conventional unit root because of its ability simultaneously test for non-linearity and nonstationarity in the data. The results provide evidence of threshold effect, suggesting that the gold return series are nonlinear processes for the period under consideration. The results from both the one-sided and two-sided threshold unit root tests suggest that the gold return series are stationary processes.

Given the inability of the one- and two-sided threshold unit root tests to differentiate full unit root from partial unit root, the study further examined the stationarity of the two regimes individually using the partial unit root tests. The results from the partial unit root tests indicate the gold return series are nonstationary processes in the first regime. However, the return series are stationary processes in the second regime. The finding of partial unit root in only one of the two regimes suggests that the gold market is weak-form efficient for most part of the period under consideration. The existence of weak-form efficiency eliminates arbitrage opportunities in the gold market, for most part of the study period.

Table 1: Threshold Effects and Unit Root Tests

	Actual Returns	Absolute Returns
Panel A:Linear Unit Root Test		
ADF	-8.77***	-5.18***
Panel B: Threshold Effect		
Wald Statistic (W_T)	51.80***	32.60**
Bootstrap p-value	0.00	0.04
Optimal Delay Parameter (m)	3	3
Threshold Parameter ($\hat{\lambda}$)	0.09	0.06
Observations in Regime 1	84.7% (399)	84.7% (399)
Observations in Regime 2	15.3% (72)	15.3% (72)
Panel C: Threshold Unit Root		
R_{2T} Statistic (2-sided Wald test)	121.0***	42.20***
Bootstrap p-value	0.00	0.00
R_{1T} Statistic (1-sided Wald test)	119.0***	40.70***
Bootstrap p-value	0.00	0.00
Panel D: Partial Unit Root		
Regime 1, t_1 Statistic	-1.45	-1.21
Bootstrap p-value	0.71	0.80
Regime 2, t_2 Statistic	10.90***	6.38***
Bootstrap p-value	0.00	0.00

***, **, and * Indicate rejection of the null hypothesis at the 1, 5, and 10 level of significance.

Acknowledgements

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Cross-Border Acquisitions and Analysts' Earnings Forecasts

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Abstract

In cross-border acquisitions (CBAs), the acquiring firm expects to benefit from growth opportunities in a foreign country. We investigate changes in financial analysts' earnings forecasts for firms completing 16,601 cross-border acquisitions *globally,* over the 1983-2008 period. For developing country acquirers, the change in the pre- and post-CBA earnings forecasts is positive and statistically significant. Our result for developing country acquirers is consistent with the 'growth option' rationale for CBAs. In multivariate logistic regression analysis we find that when the target is a private firm, the post-CBA earnings forecasts are higher for both developed and developing country acquirers.

Introduction

A recent survey by United Nations Conference on Trade and Development (UNCTAD) indicates that mergers and acquisitions by trans-national corporations are expected to rebound from an estimated $1.2 trillion in 2010 to about $1.6 ~ $2 trillion in 2012. The major destinations for anticipated mergers and acquisitions (M&A) are Brazil, China and India. There is also evidence of increased outward M&A flows from developing countries – the World Bank estimates that in 2010 FDI outflows from developing countries were $210 billion. There is considerable research on M&A activity in the domestic market (for example, Moeller et al. (2004)), and research by Rossi and Volpin (2004), Moeller and Schlingemann (2005), Chari and Chang (2009), Hope et al. (2010), Karolyi and Liao (2009), Alexandris et al. (2010) extends the analysis to cross-border acquisitions.

Some of the value-creating factors for cross-border acquisitions (CBAs) include operational, strategic and financial synergies. Specifically, when a firm undertakes a CBA, it exercises a 'growth option' by acquiring a firm in a foreign country. If the anticipated acquirer firm earnings growth is a rationale for CBAs, we should expect CBAs to influence earnings forecasts by financial analysts. In our study, we focus on whether or not financial analysts revise their earnings forecasts for acquiring firms subsequent to the CBAs.

We partition our sample into developed country and developing country acquirers and targets to gain further insight into the factors that affect financial analyst's earnings forecasts. Next, we review literature on cross-border acquisitions and then describe the data sample and discuss our empirical results.

Literature Review

The literature on cross-border acquisitions has two broad themes. The first theme looks at the quantitative and qualitative factors that motivate CBAs, and the second stream of research analyzes the performance (typically, wealth-effects event studies) of acquirers and targets in CBAs. We discuss selected literature in both areas of CBAs research and provide the motivation for our analysis.

Ferreira *et al.* (2009) examine the role that institutional investors play in cross-border acquisitions. Specifically, they test two hypotheses – the first, the substitution hypothesis, posits that the presence of foreign investors as shareholders of corporations makes takeovers by foreign entities less necessary. The second, the facilitation hypothesis, posits that foreign portfolio investors build bridges between firms internationally and their presence as shareholders of corporations actually facilitates CBAs. This suggests that the presence of foreign institutions should make a transaction between firms located in two different countries *more* likely. Using a sample of completed mergers and acquisitions over the period 2000-2005, of which about 22% are cross-border deals, they find that CBAs are more likely to occur in countries where foreign institutions hold a higher fraction of the local stock market. Specifically, they show that ownership by institutions from bidder country in the target country facilitates bilateral merger and acquisition deals. Additionally, the research shows that a larger presence of foreign institutions in the target firm, as well as in the acquirer, is positively associated with the likelihood that a bid is cross-border.

Chakrabarti *et al.* (2009) investigate the influence of cultural differences in the performance of CBAs. Using the Hofstede (1980) measure of cultural dimensions, they find that contrary to general perceptions, CBAs (during 1991-2004) perform better in the long run if the acquirer and the target come from countries that are culturally more disparate. The post-acquisition 'buy and hold' abnormal returns of the acquirer firm are positively influenced by the Hofstede variable – the

greater the cultural distance, the larger the 'buy and hold' abnormal return of the acquiring firm. This positive relationship persists after controlling for deal specific variables and country level fixed effects, and is robust to alternative specifications of long-term performance of the acquirer firm.

Hope *et al.* (2010) look at the role of 'national pride' in influencing the bid price paid by developing country acquirers in the acquisition of developed country targets. Over the 1990-2007 period, they find that developing country acquirer firms (compared to those from developed countries) bid higher on average to acquire assets in developed countries. Furthermore, bids by firms from developing countries are higher in cases where the transaction displays 'national pride' characteristics, where 'national pride' is identified through a manual reading of media articles related to the CBA.

Chari *et al.* (2011) analyze the returns to developed country acquirers that acquire targets in emerging countries for deals completed during the period 1986-2006. They suggest two possible benefits that accrue to developed country acquirers in CBAs of emerging market targets – first, acquirers can improve target value by sharing better institutional and corporate governance practices such as legal and accounting standards and thus drive value-gains for the shareholders of acquiring firms. Second, multinational firms may be more likely to share proprietary technologies and intangible assets such as brand name when they acquire majority control of the target, especially in settings with non-verifiable monitoring and weak investor protection. Consequently, the acquisition of majority control in emerging markets is likely to generate larger increases in firm value in industries with high asset intangibility if acquiring control is sufficient to overcome the weak institutional environment of the emerging market target. The authors find evidence consistent with both rationales – the magnitude of acquirer stock price increase is greater when the contracting environment in the emerging market is weaker and for acquirers in industries with high asset intangibility. For their sample of developed market acquirers gaining majority control of the emerging market target, the announcement cumulative (three day) abnormal return is 1.16% and is statistically significant.

Alexandris *et al.*(2010) provide evidence that acquirers beyond the most competitive takeover markets (US, UK, Canada) pay lower premia and realize gains, while share-for-share offers are at least non-value-destroying for their shareholders. In contrast, target shareholders within these markets gain significantly less, implying that the benefits generated are more evenly split between the involved parties. In their research, 'market competitiveness' is measured as the percentage of listed companies within a country targeted in completed deals in a specific year. The mean (median) acquisition premium paid in the US, UK and Canada is 41% (47%) higher than in the rest of the world. In regression analysis with the announcement (five-day) CAR to acquiring firms as the dependent variable, the only statistically significant explanatory variable is the market competitiveness measure. It has a negative coefficient, indicating that the acquirer gains vary inversely with the level of competition for listed targets.

Moeller and Schlingemann (2005) analyze the wealth effects of US acquirer firms that complete CBAs. US firms acquiring cross-border targets experience significantly lower stock returns in comparison to US acquirers of domestic targets. They find that bidder returns are positively related to takeover activity in the target country and to a legal system offering better shareholder rights.

In analyzing CBAs of US banks by non-US banks, Fraser and Zhang (2009) investigate the changes in operating performance of the target bank. Their comparison of pre- and post-acquisition performance of the target indicates that the cash flow profitability increases, labor utilization improves and loan losses do not rise. They find that the improved operating performance of the US target takes place for those acquisitions that occurred after the passage of legislation, in 1994, that eliminated restrictions on interstate bank branching.

Erwin and Perry (2000) analyze the impact of CBAs on the forecast errors of earnings forecasts by financial analysts. They examine 185 CBAs completed by US firms over the period 1985-97 and hypothesize that analysts will find it more difficult to predict earnings for firms that simultaneously expand geographically and outside their core business sector. Their empirical findings are consistent with a scenario in which analysts find it more difficult to assess the earnings potential of firms that expand globally outside their core product market lines in comparison to those that expand globally within their core business. The results also show that the investment opportunities in the industry of the new product market (foreign target firm) are more attractive than those that exist in the core industry of the US acquiring firm. The main conclusion of the paper is that despite the costs of increased analyst prediction errors associated with geographical and product market diversification, firms continue to adopt 'focus decreasing' foreign investment strategies to take advantage of favorable industry conditions in the target's core line of business.

Our research is motivated by the findings in Loree, Chen and Guisinger (2000, LCG henceforth). For a sample of 66 US acquirers making international acquisitions (1988-93 period), they analyze the earnings forecasts by financial analysts for the acquirer pre- and post-CBA, and the factors that affect the change in the earnings forecasts. In general, the authors find that analysts are likely to decrease their earnings estimates for firms that make foreign acquisitions. In cross-sectional regressions, they find that if the US acquiring firm has prior experience in CBAs and if it has prior target country experience, the analysts are likely to revise their earnings expectations positively, so that the overall decrease in post-CBA earnings estimate is attenuated.

As stated by LCG (2000), if stock analysts believe that an international acquisition were good or bad for a company, then this belief ought to reveal itself in changes in stock analysts' projected earnings for the companies publicly announce international acquisitions. We extend the research by LCG (2000) in the following ways – first, we expand the sample selection to include all CBAs *globally* over the period 1983-2008 and second, we investigate the change in financial analysts' forecasts for acquirers and targets categorized by developed versus developing country. We also investigate the explanatory power of several independent variables (suggested by prior research) that are likely to influence the change in financial analysts' earnings forecasts.

Data Collection and Results

Since our research requires earnings forecasts by financial analysts (source is I/B/E/S), we begin our sample in 1983 which is the start date in IBES. We also obtain all global cross-border acquisitions from the SDC Platinum database over the period 1983 to 2008 and then retain only those CBAs for which we can identify at least one pre- and post-CBAs earnings forecast for the acquiring firm from the IBES database. The merging of the two databases results in a sample of 16,601 global CBAs from 1983 to 2008. We classify the acquirers undertaking CBAs as belonging to a developing country if the per capita income of the country is classified by the World Bank as being 'low income' or 'medium income'. All countries that have 'high income' according to the World Bank are classified as developed countries.

In Table 1, for the period 1983-2008, we show the transaction value of the top ten target and acquiring countries for developed and developing countries. For developed country target firms, the US has the largest CBA value with a transaction value of $1.009631 trillion, with the UK a distant second. In developing countries, firms in Brazil are the top targets in CBAs, followed by Mexico. In analyzing the top ten acquirers in CBAs it is no surprise to find that firms in the US have the largest CBA transaction value (0.856222 trillion) and the UK is a close second. For developing acquirers, Bermuda and Brazil are the top two countries. In terms of transaction values for targets and acquirers, it is clear that the magnitude for developed country firms is several times larger than that for developing country targets and acquirers. However, recent trends show developing countries (Brazil, China and India) increasing their CBA volume significantly.

Table 1: Top Acquiring and target Countries in Cross-border M&As (between 1983 and 2008)

Top 10 Developed Target Countries		Top 10 Developing Target Countries		Top 10 Developed Acquiring Countries		Top 10 Developing Acquiring Countries	
Country Name	*Transaction Value (Mil. USD)*	*Country Name*	*Transaction Value (Mil. USD)*	*Country Name*	*Transaction Value (Mil. USD)*	*Country Name*	*Transaction Value (Mil. USD)*
USA	1,009,631	Brazil	62,734	USA	856,222	Bermuda	56,113
UK	525,938	Mexico	44,843	UK	746,158	Brazil	39,554
Germany	338,497	Argentina	38,213	Germany	286,840	China	33,349
Canada	214,366	China	28,714	Canada	271,581	Mexico	32,329
France	108,492	India	20,376	Netherlands	215,378	Russia	7,771
Netherlands	100,643	Chile	19,156	France	194,997	S. Africa	3,627
Sweden	91,873	Turkey	18,787	Spain	131,029	Argentina	2,000
Australia	81,407	Russia	17,048	Switzerland	75,071	Chile	1,851
Italy	74,422	S. Africa	15,351	Australia	48,514	India	1,173
Switzerland	43,134	Czech Rep.	14,188	Italy	44,572	Columbia	953
Total	2,859,860	Total	388,450	Total	3,066,453	Total	180,334

In non-tabulated results (available upon request), we examine the (mean) number of financial analysts providing earnings forecasts for the acquiring firm pre- and post- CBA. We partition our sample of 16,601 firms into four sub-groups – (1) developed acquirer – developed target, (2) developed acquirer – developing target, (3) developing acquirer – developing target, (4) developing acquirer – developed target. The sample sizes are 12786, 3365, 161 and 289 respectively.

In the case of a developed acquirer buying a developed country target firm, the mean number of analysts pre-acquisition is 11.30. After the acquisition, the mean number of analysts increases to 11.89. The increase is statistically significant. Next, when a developed country acquirer buys a developing target, the mean number of analysts also increases from 12.48 to 12.76, and the change is statistically significant. However, a closer examination reveals that the increase in the number of analysts is primarily driven by CBAs in the pre-2000 period. In the post-2000 period, there is no statistically significant change. When a developing acquirer buys a developing target, the mean number of analysts goes from 10.43 to 10.25; the change is statistically insignificant. Finally, when a developing acquirer acquires a developed target, the mean number of analysts

Table 2: Comparison of pre- and post-acquisition consensus median value of earnings forecasts

Year	N	Developed Acquirer – Developed Target Pre. Acq. Mean	Post. Acq. Mean	t–value	N	Developed Acquirer – Developing Target Pre. Acq. Mean	Post Acq. Mean	t–value	N	Developing Acquirer – Developing Target Pre. Acq. Mean	Post. Acq. Mean	t–value	N	Developing Acquirer – Developed Target Pre. Acq. Mean	Post. Acq. Mean	t–value
1983	1	0.32	0.37													
1984	3	5.30	3.97	-1.086												
1985	36	1.34	1.40	1.449	1	0.67	0.79									
1986	57	1.57	1.70	4.033***	4	2.12	2.24	0.819								
1987	102	2.97	3.70	1.903*	9	1.42	2.04	1.928*								
1988	130	1.36	1.75	4.895***	13	0.66	1.53	1.491								
1989	217	2.11	2.39	2.608***	19	1.59	1.87	2.363***	1	1.97	2.75					
1990	283	1.59	1.71	3.082***	38	1.96	2.50	1.324					3	0.31	1.36	2.637
1991	333	1.06	1.27	1.020	43	1.28	1.15	-0.507					1	3.68	4.00	
1992	339	1.34	1.91	1.912*	66	1.17	1.28	1.641					3	0.88	1.22	1.242
1993	410	1.10	1.23	3.302***	99	1.57	1.78	5.390***	1	1.57	1.47		5	0.65	0.70	0.474
1994	495	0.83	1.03	7.939***	133	1.10	1.26	4.053***	2	1.78	1.56	-1.290	10	0.86	1.04	2.692**
1995	664	1.47	2.33	1.525	204	1.55	1.76	4.606***	5	1.31	1.40	0.953	9	1.42	1.74	3.704***
1996	776	1.00	1.26	8.743***	225	1.33	1.72	2.630***	6	0.86	1.01	3.612**	21	3.37	3.25	-0.426
1997	925	1.76	2.19	2.047**	254	2.09	2.30	4.398***	5	4.43	3.28	-1.044	26	1.60	1.94	3.993***
1998	1098	1.56	1.72	1.083	303	1.36	2.10	1.617	9	2.38	2.59	0.525	26	1.88	2.42	4.018***
1999	1022	1.84	2.04	0.669	246	1.15	2.04	1.190	7	0.71	0.28	-1.021	19	2.57	3.67	4.720***
2000	1001	2.94	2.54	-1.237	278	-0.80	-2.27	-0.883	10	2.23	3.43	3.881***	25	4.11	5.64	6.486***
2001	637	1.16	1.08	-0.469	180	1.83	1.94	1.373	1	8.85	11.10		19	7.30	9.18	7.137***
2002	505	1.07	1.27	2.657***	122	1.29	1.39	1.049	16	1.55	1.74	0.863	13	1.54	1.52	-0.108
2003	512	0.90	1.43	3.372***	122	22.81	28.27	1.122	12	1.64	1.82	0.982	9	0.52	0.70	1.661
2004	643	1.21	1.81	3.701***	138	1.33	1.68	5.455***	17	1.75	1.51	-0.865	17	1.44	1.81	2.180**
2005	589	1.63	1.88	3.717***	195	2.68	2.97	1.079	20	0.86	1.473	4.076***	8	0.67	0.80	0.999
2006	694	1.36	1.53	1.557	220	2.57	3.41	2.452**	19	1.64	2.04	2.900***	26	1.17	1.54	5.300***
2007	747	2.79	3.29	4.211***	240	3.55	3.98	5.883***	15	2.07	2.57	4.019***	23	17.93	21.69	1.984*
2008	567	3.23	3.58	2.397**	213	5.21	5.50	1.095	15	1.78	2.26	2.576**	26	1.87	2.31	2.643**
Pre-2000	7892	6.07	7.19	1.262	1935	1.18	1.29	0.435	46	1.95	2.10	0.784	148	2.33	2.93	7.177***
Post-2000	4894	2.95	3.97	2.271**	1430	4.55	5.35	1.906*	115	1.65	1.97	4.332***	141	4.85	5.93	3.299***
Total	12786	4.88	5.96	1.886*	3365	2.61	3.02	1.749*	161	1.73	2.00	3.587***	289	3.56	4.39	5.034***

*** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table 3: Comparison of pre- and post-acquisition standard deviation of earnings consensus forecasts

Year	N	Developed Acquirer – Developed Target Pre. Acq. Mean	Post. Acq. Mean	t–value	N	Developed Acquirer – Developing Target Pre. Acq. Mean	Post. Acq. Mean	t–value	N	Developing Acquirer – Developing Target Pre. Acq. Mean	Post. Acq. Mean	t–value	N	Developing Acquirer – Developed Target Pre. Acq. Mean	Post. Acq. Mean	t–value
1983	1	0.00	0.01													
1984	3	0.97	0.79	-0.738												
1985	34	0.12	0.16	1.877*	1	0.1	0.09									
1986	56	0.15	0.24	4.065***	4	0.32	0.68	1.336								
1987	96	0.24	0.37	1.283	8	0.09	0.23	1.863								
1988	127	0.15	0.21	1.453	12	0.37	0.21	-0.667								
1989	198	0.18	0.26	1.307	17	0.21	0.26	0.814	1	0.16	0.31					
1990	243	0.15	0.23	1.754*	35	0.46	0.34	-0.491					3	0.50	0.41	-0.171
1991	305	6.94	5.11	-0.980	37	0.10	0.13	0.798					1	0.64	0.93	
1992	313	0.23	0.26	0.124	62	0.09	0.12	2.460**					3	0.06	0.06	0.614
1993	384	0.12	0.20	2.717***	98	0.13	0.18	2.151**	1	0.09	0.18		5	0.08	0.03	-0.884
1994	470	0.16	0.12	-1.060	130	0.19	0.24	1.331	2	0.07	0.48	1.365	9	0.09	0.08	-0.302
1995	639	0.42	0.24	2.587***	199	0.13	0.24	2.385**	5	.19	0.15	-0.521	9	0.03	0.11	1.883*
1996	729	0.40	0.19	-0.785	220	0.99	0.15	-0.967	6	0.22	0.28	1.158	20	0.16	0.45	1.659
1997	855	0.34	0.18	-0.793	231	0.36	0.19	-0.978	5	1.12	0.87	-0.591	25	0.10	0.21	2.363**
1998	1008	0.15	0.26	2.028**	275	0.13	0.44	1.813*	9	0.48	0.42	-0.589	26	0.18	0.41	4.276***
1999	942	0.37	0.81	3.084***	235	0.19	0.64	1.198	7	0.45	0.40	0.051	18	0.20	0.23	0.298
2000	926	0.93	1.46	2.030**	259	0.82	1.33	1.136	6	0.30	0.18	2.492*	24	0.17	0.26	0.931
2001	568	0.21	0.41	1.972**	167	0.22	0.29	2.270**	1	0.17	0.18		19	0.22	0.60	2.022*
2002	476	0.19	0.28	1.098	114	0.24	0.20	0.936	16	0.11	0.26	1.208	12	0.30	0.19	-0.661
2003	474	0.16	0.19	1.273	112	3.36	2.24	-1.000	12	0.45	0.45	-0.019	8	0.07	0.06	-0.632
2004	592	0.14	0.16	2.590***	124	0.15	0.15	1.828*	17	0.14	0.19	4.035***	17	0.23	0.37	0.988
2005	558	0.13	0.16	2.050**	175	0.17	0.34	2.185**	16	0.27	0.40	0.672	7	0.16	0.14	0.708
2006	642	0.29	1.65	1.726*	202	0.21	0.27	1.370	19	0.33	0.35	0.190	25	0.15	0.18	1.435
2007	694	0.22	0.27	2.048**	220	0.37	0.38	-0.012	15	0.20	0.34	2.820**	18	0.26	0.56	1.871*
2008	509	0.20	0.32	4.971***	192	0.39	0.63	3.048***	15	0.34	0.42	0.907	26	0.19	0.54	2.578**
Pre-2000	7329	0.60	0.66	0.607	1823	0.38	0.41	0.205	42	0.39	0.39	-0.019	143	0.15	-0.27	3.597***
Post-2000	4513	0.19	0.46	2.311**	1306	0.52	0.52	-0.064	111	0.26	0.35	1.767*	132	0.20	-0.40	3.665***
Total	11842	0.46	0.58	1.87*	3129	0.44	0.47	0.156	153	0.30	0.35	1.588	275	0.18	0.33	5.041***

*** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

increases from 8.91 to 10.11, and the change is statistically significant; however, this result is mainly influenced by the pre-2000 CBAs. Thus, if only the post-2000 period is considered, we observe an increase in the mean number of financial analysts following the acquirer firm only in the case of a developed acquirer buying a developed target.

In Table 2, we report the average of the pre- and post-CBA median of the consensus financial analysts' forecasts for acquirers in each of the four sub-groups. In the first two sub-groups, with developed country acquirers, we find that although the median earnings forecast is higher ($4.88 pre vs. $5.96 post, $2.61 pre vs. $3.02 post) the difference is marginally significant (at the 10% level). However, in the last two subgroups with developing country acquirers, we find that the median consensus earnings forecast is higher post-CBA and is statistically significant. Further, we observe that for a developing acquirer acquiring a developing target, the increased earnings forecast is a post-2000 phenomenon. In comparison, when a developing acquirer buys a developed target, the increase in post-CBA consensus forecast is observed both in the pre-2000 as well as the post-2000 time periods.

Our results are in contrast to those in Loree, Chen and Guisinger (2000). They find that for their sample of 66 US firms (1988-93 period) the overall post-CBA earnings estimates of financial analysts is lower than the pre-CBA earnings forecasts. In our analysis of global CBAs by US and non-US firms we reach a different conclusion. In the case of developing country acquirers, we show a statistically significant post-CBA increase in the earnings forecast. This evidence is consistent with the growth option rationale for CBAs and our findings are consistent with financial analysts revising their earnings forecasts upwards after a firm from a developing country announces a CBA. In the case of developed acquirers, we find an increase in the post-CBA earnings forecasts, but with marginal (10% level) statistical significance.

Having investigated the change in the level of financial analysts' earnings forecasts (pre- and post-CBA), we now examine the possible variability in the consensus earnings forecasts. In prior work, Erwin and Perry (2000) show the there is an increase in the prediction error (forecast minus actual) of analysts' earnings forecasts post-CBAs where the acquiring firm buys a target in a different core product market. For our sample of CBAs (Table 3), we compare the pre- and post-CBA standard deviation of consensus analysts' forecasts of earnings. The main observation is that there is no evidence of a statistically significant change in the variability of earnings forecasts for the first three sub-groups of the data sample. In contrast, for the last sub-group (developing acquirer and developed target) there is a statistically significant increase in the standard deviation in the earnings forecasts post-CBA. This result combined with the previous empirical finding (Table 2), indicates that for this sub-group there is not only an increase in the median earnings forecasts, but also an increase in the variability of forecasts. The increase in variability may be a reflection of the uncertainty induced by the developing acquirer adjusting to, and incorporating, corporate governance standards necessitated by acquiring a target firm in a developed country. Chari et al. (2011) make the point that when a developed acquirer buys a developing target, a source of value creation is the transfer of developed acquirer corporate governance practices to the developing target. Rossi and Volpin (2005) find that in cross-border deals, targets are typically from countries with poorer investor protection than their acquirers' countries, suggesting that cross-border transactions play a governance role by improving the degree of investor protection in target firms. Thus, in reference to the finding for the sub-group (developing acquirer and developed target), it is plausible that the developing acquirer may have to adopt developed country corporate governance practices partially, if not completely. The process of adjusting to the newer corporate governance model is likely to engender variability in the forecasts by financial analysts for the developing country acquirer.

In non-tabulated results (available upon request), we compare actual reported earnings (from I/B/E/S) of the acquiring firm pre- and post-CBA and find that for the developed acquirer buying a developed target, the actual earnings are higher after the CBA. This is true for both the pre-2000 and post-2000 time periods. When a developed acquirer buys a developing target, the actual earnings increase (statistically significant at 1%) is observed only in the post-2000 period. For developing acquirers, for the overall 1983-2008 time period we find no material difference between the actual pre- and post-CBA earnings. It is only during the pre-2000 period that we observe an increase in post-CBA actual earnings for the sample when a developing acquirer buys a developed target. These empirical results are in contrast to the analyst forecasted earnings (Table 2).

For developed acquirers, the analyst forecasts of post-CBA earnings are not significantly different from the pre-CBA forecasts (Table 2, first two sub-groups). But when we examine the actual earnings (non-tabulated results, available upon request) for the same two sub-groups, the post-CBA actual earnings are significantly higher post-CBA. The empirical finding for the two developing acquirer sub-groups is the opposite. In Table 2, for the 1983-2008 period, we find that analyst forecasts post-CBA are higher compared to pre-CBA but when the actual reported earnings are compared, there is no significant difference between pre- and post-CBA. The one exception is during the pre-2000 period when a developing acquirer buys a developed target, the actual earnings are higher. It appears that financial analysts are more optimistic about post-CBA earnings (and with greater variability) for developing country acquirers than the actual evidence on post-CBA earnings.

Table 4: Change in Number of Financial Analysts, Median value of Consensus Forecasts, Standard Deviation of Consensus Forecast and Actual Value of Earnings

	Developed Country Acquirers		Developing Country Acquirers		Developed Country Acquirers		Developing Country Acquirers	
	B	Walds	B	Walds	B	Walds	B	Walds
	Panel A: Change in Number of Analysts				Panel B: Change in Median Value of the Forecast			
Developing Country Targets	-0.231	3.513*	1.144	1.217	-0.301	3.861**	-1.491	1.337
Related Industry (4SIC)	0.163	11.264***	0.043	0.019	-0.055	0.861	0.349	0.839
Private Targets	0.191	14.292***	0.642	2.825*	0.213	11.278***	1.616	9.305***
Geographic Distance	0.045	4.149**	0.154	0.363	0.131	24.545***	-0.528	2.788*
Cultural Distance	-0.080	11.374***	-0.097	0.376	-0.047	2.636	0.413	3.900**
Target Country GDP	-0.027	2.185	0.187	1.893	-0.077	11.362***	-0.103	0.361
Target Country GDP growth	-0.213	0.051	4.729	1.011	-0.215	0.035	15.451	8.698***
Target Country Corruption	0.034	1.440	-0.179	0.677	0.023	0.417	0.278	1.084
Target Country Investor Right Protection	-0.005	0.053	-0.203	0.961	0.016	0.294	0.374	1.994
Transaction Size	0.000	0.000	0.056	0.355	0.009	0.404	0.213	3.283*
Post 2000	-0.153	10.701***	-0.006	0.000	0.059	1.024	1.099	6.238**
Intercept	0.273	0.235	-6.136	3.185*	2.290	11.059***	3.186	0.547
N	7,799		188		7,799		188	
Nagelkerke R Square	0.014		0.067		0.011		0.292	
	Panel C: Change in Standard Deviation of Consensus Forecast				Panel D: Change in Actual Value of Earnings			
Developing Country Targets	-0.133	0.874	0.083	0.005	-0.322	5.952**	-0.118	0.012
Related Industry (4SIC)	0.072	1.658	0.033	0.009	-0.046	0.803	-0.607	3.109*
Private Targets	0.024	0.170	0.031	0.005	0.149	7.690***	0.300	0.510
Geographic Distance	0.014	0.316	0.536	3.552	0.070	9.220***	-0.117	0.175
Cultural Distance	0.012	0.198	0.203	1.156	0.006	0.061	0.602	9.372***
Target Country GDP	-0.061	7.826***	0.013	0.007	-0.040	3.974**	-0.236	2.266
Target Country GDP growth	1.067	0.978	2.765	0.356	4.024	16.398***	13.243	7.077***
Target Country Corruption	-0.011	0.112	0.225	0.845	0.027	0.804	0.552	5.481**
Target Country Investor Right Protection	-0.013	0.214	-0.028	0.014	0.036	2.019	0.093	0.186
Transaction Size	-0.022	2.583	0.185	2.847*	0.053	17.422***	0.048	0.212
Post 2000	-0.041	0.591	-0.230	0.288	0.097	3.783*	0.416	1.055
Intercept	2.452	13.563***	-5.999	2.458	0.663	1.226	4.185	1.193
N	6,765		165		7,799		188	
Nagelkerke R Square	0.004		0.118		0.011		0.186	

*** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

In Table 4, (Panels A~D), we show the results of multivariate logistic regressions that investigate the explanatory power of several independent variables. Dependent variable definitions are as follows: *Change in Number of Analysts*, which equals 1 if the post-acquisition number of analysts is larger than the pre-acquisition number of analysts, and equals 0 otherwise; *Change in median value of consensus analysts' forecasts*, which equals 1 if the post-acquisition consensus median value is larger than the pre-acquisition consensus median value, and equals 0 otherwise; *Change in std. deviation of consensus forecasts*, which equals 1 if the post-acquisition std. consensus is larger than the pre-acquisition std. deviation of consensus earnings forecasts, and equals 0 otherwise; *Change in actual value of earnings*, which equals 1 if the post-acquisition actual

earnings is larger than the pre-acquisition actual earnings, and equals 0 otherwise. Similarly, independent variable definitions are: *Developing country target*: a dummy variable which equals 1 if the target country is a developing country and equals 0 if the target country is a developed country; *Related industry (4SIC)*: a dummy variable which equals 1 if the acquiring firm and the target firm have the same 4-digit SIC industry code, and equals 0 if they are from different 4-SIC industries; *Private targets*: a dummy variable which equals 1 if the target firm is a privately held firm; and equals 0 if the target firm is a publicly listed firm; *Geographic distance*: log transformed number of kilometers between the capital cities of the target and acquiring countries; *Cultural distance*: aggregated four cultural dimensions developed by Hofstede (1980) to measure the cultural difference between the acquiring country and the target country; *Target country GDP*: Log transformed GDP of the target country in the latest fiscal year end before the current acquisition; *Target country GDP growth*: The GDP growth rate of the target country in the latest fiscal year end before the current acquisition; *Target country corruption*: the corruption index value for a country developed by Transparency International; It is measured at the latest fiscal year end for each target country before the acquisition; *Target country investor rights protection*: The anti-self-dealing index developed by Djankov et. al. (2008) that measures the legal protection of minority shareholders; *Transaction size*: acquisition deal value divided by the market cap of the acquiring firm; *Post-2000:* a dummy variable that equals 1 if the cross-border acquisition is after January 1, 2000 and equals 0 otherwise.

From the results shown in Table 4, Panel A we observe that for developed country acquirers (sample size of 7799 CBAs), the number of financial analysts following the acquirer increases when the target is in a related industry; when the target is a private firm and the greater the geographic distance between acquirer and target. On the other hand, the number of financial analysts decreases when the cultural distance between the developed acquirer and target is greater. This also obtains for CBAs in the post-2000 period. We do not observe any significant independent variables in the sample of developing country acquirers (sample size of 188 CBAs).

In Table 4, Panel B for the sample of developed country acquirers the independent variables that increase post-CBA median of the consensus earnings forecasts are – private targets and geographical distance whereas developing country targets and target country GDP tend to decrease median consensus forecasts. For the developing country acquirers, the variables that increase median consensus forecasts are – private targets, cultural distance, target country GDP growth and CBAs in the post-2000 period.

We analyze the change in the variability of the consensus analyst forecasts and show the results in Table 4, Panel C. We find that for developed country acquirers the only significant variable is the target country GDP with a negative sign, implying that the larger the target country's GDP the lower the variability in analysts' forecasts for developed acquirer firms. For developing country acquirers, we find no significant independent variable.

In the last panel of Table 4 (Panel D), we investigate factors that influence the change in the actual reported earnings. For the developed country acquirers, the variables with a positive statistically significant effect are private targets, geographic distance, target country GDP growth and transaction size. The variables with a negative impact are if the target is in a developing country and the target country GDP. For the developing country acquirers, three variables are significant, and all with a positive sign. The variables are cultural distance, target country GDP growth, and the target country corruption variable.

Conclusions

We investigate changes in financial analysts' earnings forecasts for firms completing CBAs. Our sample of 16,601 CBAs covers all global CBAs, over the 1983-2008 period. We find that for developed country acquirers the post-CBA median consensus earnings forecast is higher than the pre-CBA forecasts, however, the difference is marginally significant (at the 10% level). For developing country acquirers, the change in the pre- and post-CBA forecasts is positive and statistically significant (1% level). This result is in contrast to that in Loree et al.(2000) who find a decrease in post-CBA earnings forecasts for a sample of US based acquirers. Our results for developing country acquirers are consistent with the growth option rationale for CBAs and it appears that financial analysts revise their earnings forecasts upwards for developing acquirers.

In analyzing the change in the variability of earnings forecasts, we observe that only in the case when a developing country acquirer buys a developed country target is there a statistically significant change (increase) in the standard deviation of the earnings forecasts post-CBA. In multivariate logistic regression analysis we find that when the target is a private firm the post-CBA earnings forecasts are higher for both developed and developing acquirers. Other independent variables that are significant for developed acquirers are not so for developing acquirers. For the regressions that consider the change in the standard deviation of the consensus earnings forecasts, we find only one independent variable (target country GDP) that is significant for developed country acquirers.

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Value Stocks and Accounting Screens: Has a Good Rule Gone Bad?

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Abstract

Our results tend to indicate that the financial statement variables identified by Piotriski (2000) no longer distinguish future winners and future losers among those firms with high book-to-market ratios. Although we are able to replicate Piotroski's findings in the 1976-1996 window used for his study, the results not only do not hold in the 11 years since the end of his study window, they are reversed with high F-Score firms significantly underperforming both low F-Score stocks and the portfolio of all high book-to-market stocks. Market risk is the factor overlooked by Piotroski (2000) that appears to best explain our findings.

Introduction and Literature Review
Value Stock Returns: Market Efficiency or Inefficiency?

A significant body of research has found that as a group, "value stocks" (i.e., firms with above-average book-to-market ratios) tend to outperform "growth stocks" or "glamour stocks" (i.e., firms with below-average book-to-market ratios). Findings along these lines date back to at least Rosenberg, Reid, and Lanstein (1984), and of course the best-known paper with this finding is the Fama and French (1992) paper. This "value premium" is robust to alternative measures of value such as earnings-to-price ratio or cash flow-to-price ratio (Lakonishok, Shleifer, and Vishny (1994), La Porta, Lakonishok, Shleifer, and Vishny (1997)), across firm-size (Chan and Lakonishok (2004), Fama and French (2006)), in pre- and post-Compustat US data (Fama and French (2006)), and internationally in twelve of the thirteen major markets examined by Fama and French (1998).

Although the existence of a value premium is widely accepted, investigators have reached widely disparate conclusions regarding the underlying reasons for this outcome. For instance, the aforementioned Fama and French (1992) paper treats the difference in the average returns of high- versus low-book-to-market firms as being consistent with the notion of market efficiency. In essence, a low book-to-market ratio is viewed as evidence that the firm's shares are deemed as risky; thus, the higher average returns on such shares is interpreted as rewarding investors for accepting that risk. Other papers with results that are broadly consistent with this theme include Penman (1991), Fama and French (1995), and Chen and Zhang (1998).

On the opposite side of this debate are those scholars who argue that the higher average returns on high book-to-market firms provide evidence of market inefficiency. Specifically, Lakonishok, Shleifer, and Vishny (1994) argue that high book-to-market ratios result from excessively negative market predictions of future performance, based on weak past performance. LaPorta et al. (1997) argue that these negative expectations tend to be followed by better-than-expected earnings results.

In comparing these and other papers, Piotroski (2000) argues that value stocks, more than growth stocks, are appropriate targets for fundamental analysis based on the firms' financial statements. This is because investors typically price growth stocks primarily on optimistic forecasts, rather than on financial information. Value stocks, on the other hand, are best evaluated through a careful analysis of the financial fundamentals. Thus, Piotroski (2000) argues that it is worthwhile to explore the relative attractiveness of value stocks, based on information that can be gleaned from the financial statements.

Fundamental Analysis of Value Stocks

While the Piotroski (2000) article forms the basis for this paper, Piotroski himself notes that his is far from the first effort to find stocks that the market has undervalued due to incorrect expectations. Prior efforts in this regard include articles by Frankel and Lee (1998), Dechow and Sloan (1997), and LaPorta (1996).

In particular, one may wish to identify promising value stocks based on fundamental analysis of these companies' financial performance. The positive market-adjusted returns of value stocks as a group occur despite the fact that a majority of individual value stocks actually underperform the market. Thus, there has been much interest in attempting to use financial statement analysis to distinguish those specific value stocks that are likely to form the high-performing minority from those value stocks that are likely to form the underperforming majority. If one can do so, then the already-positive market-adjusted returns that one would expect to receive from a value stock portfolio can be enhanced.

Successful efforts to use fundamental analysis to predict future market returns include those of Holthausen and Larcker (1992), Lev and Thiagarajan (1993), and Abarbanell and Bushee (1998).

The Piotroski Methodology

Since the present paper is intended primarily as an attempt to replicate Piotroski's (2000) results, we will describe his work in somewhat more detail than would ordinarily be included in a literature review. For each year from 1976 through 1996, Piotroski identifies those firms whose book-to-market ratios fall into the highest quintile. (To expand on his basic results, he performs a separate division of firms into terciles, based on market capitalization. His set of high book-to-market stocks is then subdivided based on whether these stocks fall into the high, medium, or low market capitalization tercile of the overall market.)

Each stock in the top book-to-market quintile is then evaluated on nine separate factors, which we itemize below, and receives a score of either 1 ("good") or 0 ("bad") on each of these factors. The firm's scores on these 9 factors are summed, resulting in an "F-Score" ranging from 0 to 9, inclusive. Firms that have higher F-Scores are hypothesized to be the most likely to produce positive market-adjusted returns over the ensuing year, and vice versa. Market-adjusted return realizations are evaluated separately for firms with each score from 0 through 9; in addition, results are evaluated for firms with scores of 0 and 1 combined ("Low Score") and firms with scores of 8 and 9 combined ("High Score").

The nine factors that Piotroski (2000) considers can be divided into indicators of the following: profitability; leverage, liquidity, and source of funds; and operating efficiency. In the area of profitability, four specific indicators are chosen. Scores of 1 are assigned for the following: ROA (net income before extraordinary items over beginning-of-year total assets) is positive; CFO (cash flow from operations over beginning-of-year total assets) is positive; ΔROA (current year's ROA minus prior year's ROA) is positive; and ACCRUAL (ROA minus CFO) is negative. Otherwise, scores of 0 are assigned for the respective factors.

In the area of leverage, liquidity, and source of funds, three specific indicators are chosen. Scores of 1 are assigned for the following: ΔLEVER (the most recent year's ratio of long-term debt to average total assets, minus the corresponding ratio for the prior year) is negative; ΔLIQUID (the most recent year's ratio of current assets to current liabilities minus the corresponding ratio for the prior year) is positive; and EQ_OFFER (an issuance of common equity within the past year) did not occur. Otherwise, scores of 0 are assigned.

In the area of operating efficiency, two specific indicators are chosen. Scores of 1 are assigned for the following: ΔMARGIN (current year's ratio of gross margin to total sales, minus the corresponding number for the prior year) is positive; and ΔTURN (current year's ratio of total sales to beginning-of-year total assets, minus the corresponding number for the prior year) is positive.

Summary of Key Findings by Piotroski

While Piotroski (2000) evaluates a wide variety of issues, for purposes of this paper we can describe his key findings rather succinctly. First, those stocks comprising the top book-market quintile in any given year tend to have been issued by firms whose financial performance has been poor: profitability tends to have been both poor and declining, leverage tends to have increased, and liquidity tends to have decreased. (Piotroski 2000; Table 1, Panel A.) Over the ensuing one- and two-year periods, the portfolio as a whole will out-perform the market; but, the majority of individual stocks within the portfolio will underperform the market. (Piotroski 2000; Table 1, Panel B.) Further, for the individual value stocks the market-adjusted return is more strongly (positively) correlated with the firm's overall F-Score than with any of the nine specific indicators comprising the F-Score. (Piotroski 2000; Table 2.)

The heart of Piotroski's (2000) findings may be found in his Table 3. This table demonstrates that market-adjusted returns over the ensuing year tend to improve rather steadily as the F-Score increases. Statistical tests indicate that the excess of the market-adjusted returns of the High Score firms over those of the Low Score firms is significant at the 1% level. The same is true when comparing the High Score firms to the value stock portfolio as a whole. The statistically significant superiority of the High Score firms to both the Low Score firms and the overall portfolio applies not only to the means, but also to the 10th, 25th, 50th, 75th, and 90th percentiles. Table 4 tests for size effects. It finds that the superiority of the mean and median market-adjusted returns of High Score firms is strongest among those value stocks falling into the smallest market-value tercile, somewhat smaller (but still highly significant) among those value stocks falling into the middle market-value tercile, and insignificant (or at best marginally significant) among those value stocks falling into the largest market-value tercile.

Are the Piotroski Results Replicable in Subsequent Periods?

With any model such as that of Piotroski (2000), it is important to avoid the assumption that the results found over a particular time period will persist into the future. First, *post hoc* analysis, even if based on plausible hypotheses, will inevitably find some "patterns" by random chance. If a given result that has been found to be statistically significant over one time period can be demonstrated to be statistically significant over ensuing time periods, then obviously this will dramatically lessen concerns that the result in question was simply the "luck of the draw."

Second, even when a given result's statistical significance was not a matter of random chance, there is no guarantee that this result will be repeated in a future time period. With regard to potential market inefficiencies in particular, there is a logical case to be made for the notion that over time, "good models become bad." According to this argument, if some form of systematic mispricing of assets can be demonstrated to exist, then those individuals and institutions that possess the means to do so will exploit that mispricing. For instance, if risk-adjusted returns to a given subset of assets are demonstrated to be positive, then demand for these assets will increase, thereby making these assets more expensive and, in the process, lowering their future returns. The opposite will apply when a given subset of assets is demonstrated to have negative risk-adjusted returns. Over time, the risk-adjusted returns of both subsets of assets will move toward zero, and the decision rule in question will cease to produce excess returns.

With the Piotroski (2000) model in particular, another motivation for examining replicability in subsequent periods is the changes in the overall market environment during the time since Piotroski's sample period. There were, of course, a variety of financial market conditions during the Piotroski sample period, including the relatively flat market of the late 1970s, the mostly strong market of the 1980s, a dramatic interruption to that up-market in the form of the October 1987 crash, and the tremendous increase in overall market values during much of the 1990s. Nonetheless, one could make a strong argument that the overall sample period used by Piotroski was one of strong overall market returns, in which a model might well "discover" positive market-adjusted returns for the stocks of companies that have shown strong financial fundamentals but have relatively low market prices.

It would, however, be difficult to make the same argument regarding the time frame since the end of the Piotroski (2000) sample period. Since the Piotroski sample period, overall market results can reasonably be described as having demonstrated both an unusually high level of volatility, and poor overall returns. In particular, this time frame has seen two major downturns in market valuations, the first being after the burst of the "tech bubble" during the early part of the 2000-2009 decade, and the second being the financial meltdown of 2008. Thus, if the Piotroski findings were realized simply because the stock market climate, or the overall economic climate, were conducive to high returns on low-priced stocks with strong recent financial ratios, one would not necessarily expect similar results over the ensuing ten to twelve year period.

Thus, the goal of this paper is to examine whether the Piotroski (2000) results continue to hold when one pushes back the end date of the sample period as far as the methodology will allow based on currently available data, and also whether those results hold specifically to a period that falls exclusively after the Piotroski sample period.

Data and Methodology

Using financial statement data from Compustat, and market returns and market capitalization data from CRSP, the following methodology is employed for each fiscal year in the sample period (1976-2007). For each fiscal year T, each firm's book-to-market ratio and total market value are calculated as of the fiscal year end date for fiscal year end T-1. (See Piotroski 2000, p. 11, footnote 8.) Firms are sorted into quintiles based on their book-to-market ratios, and are separately sorted into terciles based on size. Each firm that falls within the top book-to-market quintile is considered part of the sample, subject to availability of all necessary financial data and market return data.

For each such firm, each of the financial indicators described above is calculated for fiscal year T, and the firm's F-Score for fiscal year T is calculated based on these indicators. Raw returns and market-adjusted returns are then calculated for the one-year period beginning in the fifth month after the end of fiscal year T. An observation is dropped from the sample if the firm's fiscal year end date for fiscal year T is not clear in Compustat, if the firm's fiscal year T lasts for a period other than 12 months (due to a change in fiscal year end date from one year to the next), or if there is not sufficient information to calculate all variables of interest, including those that involve changes from fiscal year T-1.

This process is repeated for each year from 1976-2007. (Had we attempted to cut extend the dates for the financial statement information through 2008, we would have stock return information only for a portion of firms, since the one-year return observation period runs for a one-year period beginning in the fifth month after the fiscal year end date.) All observations with a given F-Score, regardless of the specific year within the sample period, are initially grouped together for purposes of determining the distribution of returns for that F-Score. Then, the same tests are re-run after separating the sample period into two sub-samples. The first sub-sample is for fiscal years ending in 1976-1996, inclusive, so as to match

the sample period of Piotroski (2000). The second sub-sample is for the subsequent period of fiscal years 1997-2007, inclusive.

Results

While all of the tables from this paper are omitted for purposes of brevity, results of various tests are described below.

Descriptive Statistics for the Sample of High Book-to-Market Firms

A review of the descriptive statistics generated by our tests for the 1976-2007 sample period reveals the following. First, as a group high book-to-market (value) stocks tend to be below-average in size and in profitability (as measured by ROA), with more rapid declines in ROA than those displayed by the average firm. Liquidity declines more slowly for value firms than for the average firm; and, unlike the average firm, value firms have declining leverage. Interestingly given the distress story for value firms, value firms appear to be improving in operating efficiency in comparison to the average firm. Change in asset turnover is positive for value firms, but negative for the average firm.

In comparing the Piotroski (2000) and post-Piotroski periods, we find that the percentage of value firm year observations with a positive ROA declines from 68% to 60%. Another striking difference is the mean change in gross margin between value firms and the universe pre- and post-Piotroski. In the earlier window the average firm was increasing in efficiency, while the average firm's efficiency was declining. Post-1996, the sample of all firms was experiencing decreasing margins, but the margin compression of value firms was much smaller. Finally, the standard deviations increased for every "indicator" variable other than ΔLIQUID, indicating that financial ratios were more widely varied among value stocks during the latter sub-period.

A comparison of market-adjusted returns shows that in 21 of the 32 years, a value strategy provides statistically significant excess returns over a growth strategy. In 4 years a growth strategy outperforms a value strategy, and in 7 years there is not a statistically significant difference in the results. The value strategy outperforms the growth strategy over the entire 1976-2007 sample period, the Piotroski (2000) sub-period (1976-1996), and the post-Piotroski sub-period (1997-2007). These results are qualitatively the same as those of Fama and French (2006), but individual years are not directly comparable as Fama and French use calendar years and our results are based on fiscal years.

Usefulness of Financial Analysis in Predicting Forward Returns of Value Stocks

The primary purpose of this paper is to determine whether the ability of the Piotroski (2000) model to select value stocks based on fundamental financial signals has improved, diminished, or disappeared during the time since the end of the Piotroski sample period. Piotroski's results related to this issue are displayed in his Table 3. Our results are summarized as follows; and, while we tested for both absolute and market-adjusted returns, our discussion will focus on the market-adjusted returns. First, within the 1976-1996 time period studied by Piotroski (2000), although our sample size is different from his our results are qualitatively similar. In particular, we find that the one year market-adjusted return to high F-Score firms is 5.70% higher than the return to all value stocks and 25.76% higher than the return to low F-Score firms. Although the relationship is not strictly monotonic, market-adjusted returns show an increasing trend as F-Score improves in this early window.

The primary contribution of this work, however, lies in our findings that are not limited to the time period studied by Piotroski (2000). When we extend the F-Score methodology to encompass all currently available data, high F-Score firms cease to outperform low F-Score firms on a market-adjusted basis; in fact, the high F-Score firms actually underperform the low F-Score firms by 16.00% (p-value = 0.0000) on a market-adjusted basis. High F-Score firms continue to outperform value stocks as a group, but only by 1.35% (p-value = 0.0572), as compared to 5.70% (p-value = 0.0000) for the 1976-1996 sub-period.

Since we were able to replicate the Piotroski (2000) results during his sample period of 1976-1996, these disparate findings clearly are being driven by the returns during the post-Piotroski time period. When we examine returns specifically during the 1997-2007 period, we find that this period was not kind to high F-Score value stocks. On a market-adjusted basis, high F-Score stocks underperformed all value stocks by over 14% and low F-score stocks by over 32%, both results displaying p-values of 0.0000.

The ability of the Piotroski (2000) model to discriminate between "winners" and "losers" among value stocks appears to have completely reversed after the Piotroski sample period: not only does a high F-Score not predict outperformance, it predicts underperformance! Did a good model go bad, or is there another explanation for this finding?

Fundamental Analysis and Firm Size

The outperformance of value stocks is related to firm size. Loughran (1997) contends that the entire post-1963 value premium is driven by small firms and does not exist in the largest size quintile, which makes up the bulk (73%) of the total market value of publicly traded firms. Indeed, Piotroski (2000) found his strongest results among the subset of value stocks that were in the smallest market capitalization tercile of the overall stock market. (This subset included a majority of his overall sample, since most of the stocks that were in the top book-market quintile were also in the smallest market value tercile.) The results for those value stocks falling within the middle tercile of market values, while not as strong as those for the smallest value stocks, were nonetheless easily significant at the 1% level. Results for the largest firms were generally not statistically significant, and at best were marginally significant. These results are displayed in Piotroski's (2000) Table 4.

Our own tests of this issue for our sample produce the following results. First, for the Piotroski (2000) sub-period from 1976-1996, our results are arguably even stronger than Piotroski's. Our results not only agree with his finding regarding the excess returns of high F-Score stocks among smaller firms, but also show statistically significant results even among the largest firms, and show results among mid-sized firms that are even stronger than those of small firms.

When we test the interaction of firm size with the F-Score for the entire 1976-2007 period, we find that the results described above for the longer period are not being driven by firm size. High F-Score firms only slightly outperform the group of all value stocks in the small and larger firm groups, while they are not distinguishable in the medium firm group. Further, high F-Score firms significantly underperform low F-Score firms in each size tercile.

The reversal noted between the 1976-1996 sub-period and the overall period from 1976-2007 is, once again, driven by the last 11 years of our sample window. Within this period of time, high F-Score firms underperformed both the group of all value stocks and the group of low F-Score firms by a large and highly significant margin in every size category.

Market Risk and the Value Premium

The value premium has received much ongoing attention in the financial economics literature because it points out a flaw in the long-held belief that markets are efficient and return is an increasing function of risk as defined by beta in the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965). Over our full sample period, value stocks outperform growth stocks by a market-adjusted 11.34% per year. In an efficient market governed by CAPM, this outperformance should be attributable to additional market risk; yet, as noted by Fama and French (1992), value stocks have smaller betas on average than do growth stocks, leading Fama and French (1995) to posit that the value premium is compensation for systematic risk not captured by beta. Much of the evidence on market risk and the value premium was completed with data ending in the late 1990s, such as in Chan and Lakonishok (2004), using data from 1963 forward. Fama and French (2006), as well as Ang and Chen (2007), document that there is no cross-sectional variation in return prior to 1963 related to book-to-market that is not adequately explained by beta. Before we move on to try to explain the failure of F-Score in explaining extended window market-adjusted returns, it is useful to confirm that the value premium in the later window is not captured by beta. When we test this issue, consistent with prior research we find that the low book-to-market (growth) portfolio has a significantly larger beta than does the high book-to-market (value) portfolio in all three time periods. This indicates that the value premium of the high book-to-market (value) portfolio described earlier is not explained by market risk as measured by beta.

Market Risk and F-Score

A question not addressed by Piotroski (2000) is whether the excess market-adjusted returns of high F-Score stocks in the 1976-1996 window is explained by beta. Given that the market-adjusted returns are calculated by subtracting the CRSP value weighted index from each stock's return, it is possible that apparent outperformance of high F-Score stocks in the 1976-1996 window is an artifact of F-Score capturing variation in market risk.

In our replication of the Piotroski (2000) time period, we found that on a market-adjusted basis high F-Score stocks outperformed all high book-to-market firms by 5.7%, and outperformed low F-Score stocks by 25.76%. While the results described immediately above note that the premium for value stocks within this time period cannot be explained by a larger beta on value stocks, the same is not true of the premium for high F-Score stocks. Rather, we found that within the 1976-1996 time period high F-Score stocks had an average beta of 0.9663 compared to 0.9235 for all high book-to-market stocks and 0.8774 for low F-Score stocks. Due to their higher market risk, one would expect the market-adjusted returns of high F-Score stocks to be higher; so, the excess returns found in the 1976-1996 window cannot be attributed solely to F-Score.

The same pattern holds with the entire 1976-2007 window and with the more recent 1997-2007 window: the portfolio with the highest beta exhibits the highest return. The difference, of course, is that here the high F-Score value stocks have lower betas and lower market-adjusted returns than do their counterparts with low F-scores.

Conclusion and Future Research Direction

Our results tend to indicate that the financial statement variables identified by Piotriski (2000) no longer distinguish future winners and future losers among those firms with high book-to-market ratios when the test sample is extended to include all observations available since the publication of his study. Although we are able to replicate Piotroski's findings in the 1976-1996 window used for his study, the results not only do not hold in the 11 years since the end of his study window, they are reversed with high F-Score firms significantly underperforming both low F-Score stocks and the portfolio of all high book-to-market stocks. These results are robust to controlling for firm size with market capitalization tercile sorts.

Market risk is the factor overlooked by Piotroski (2000) that appears to best explain our findings. During the 1976-1996 window, high F-Score stocks had the highest betas and the highest market-adjusted returns. This relationship flipped in the 1997-2007 window, with low F-Score firms having the highest betas and correspondingly higher market-adjusted returns.

Future work might focus, not just on overall periods of relative stock market weakness, but also on specific periods in which the market as a whole is experiencing a downturn. For instance, in addition to looking at the 1997-2007 subsample as a whole, it might well be informative to test the results from one year to the next. Obviously, the resulting reduction in sample size will weaken statistical power to some extent. However, given that we had over 8,400 observations in the 1997-2007 period, a year-by-year breakdown should retain sample sizes sufficiently large to produce statistically significant results for any truly meaningful differences.

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