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TABLE OF CONTENTS

EDITORIAL REVIEW BOARD III

LETTER FROM THE EDITOR VII

THE INFLUENCE OF R&D INVESTMENT AND DIVIDEND PAYMENT TAX INCENTIVES ON CORPORATE DIVIDEND POLICY 1
M. Catherine Cleaveland, Mercer University

INTERACTION BETWEEN MONETARY AND FISCAL POLICY IN JORDAN 19
Omar Al-Zoubi, Central Bank of Jordan
Nahil Saqfalhait, University of Jordan
Ahmad AL-Majali, Central Bank of Jordan

WHAT SHOULD WE TEACH OUR STUDENTS ABOUT INTEREST RATES DETERMINATION 41
A. Wahhab Khandker, University of Wisconsin-La Crosse
Amena Khandker, University of Wisconsin-La Crosse

IMPROVING TEACHING EFFECTIVENESS IN INTRODUCTORY ECONOMICS COURSES USING THE TEST OF UNDERSTANDING OF COLLEGE ECONOMICS (TUCE) 55
Richard H. Courtney, Saint Mary's College of California
William Lee, Saint Mary's College of California
Kara Boatman, Saint Mary's College of California

IS THERE SUCH A THING AS A FREE TEXTBOOK? 71
Simon Medcalfe, Augusta State University

THE DEBT INDEX AND ITS RELATION TO ECONOMIC ACTIVITY 79
John J. Bethune, Barton College

USING REFLECTION PAPERS IN PRINCIPLES OF MACROECONOMICS CLASSES 85
Jodi Olmsted, University of Wisconsin Stevens Point
Stefan Ruediger, University of Wisconsin Stevens Point

ASCERTAINING THE EFFICIENT FRONTIER IN THE CLASSROOM 97
Stephen C. Caples, McNeese State University
Michael E. Hanna, University of Houston—Clear Lake
Grady Perdue, University of Houston—Clear Lake

LEARNING BY DOING MODELS TO TEACH UNDERGRADUATE ECONOMICS 105
Indranil K Ghosh, Saint Xavier University

STUDENTS' PERCEPTION OF EFFECTIVE TEACHING 121
Ehsan Latif, Thompson Rivers University
Stan Miles Thompson Rivers University

SOVEREIGN CREDIT QUALITY IN THE EUROZONE:
A PRELIMINARY CLASSIFICATION SYSTEM 131
G. N. Naidu, Illinois State University
Askar H. Choudhury, Illinois State University

LETTER FROM THE EDITOR

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THE INFLUENCE OF R&D INVESTMENT AND DIVIDEND PAYMENT TAX INCENTIVES ON CORPORATE DIVIDEND POLICY

M. Catherine Cleaveland, Mercer University

ABSTRACT

Although much research on corporate dividend policy exists, the evidence is far from conclusive. Understanding how dividend taxes affect firm-level decisions is crucial to evaluating dividend imputation credits which provide shareholder-level tax credits for dividends received or decreased shareholder-level dividend tax rates, which reduce the double taxation of dividends. Using changes in New Zealand and Australia's tax regimes, this paper provides new insight into the corporate dividend policy views. The results support the double taxation and tax irrelevance corporate dividend policy views in dividend-paying firms operating in a tax regime with dividend imputation and capital gains taxes. By documenting a significant decrease in R&D investment and increase in dividend payment after a change in dividend taxes, this paper also highlights a void in the current corporate dividend policy views and demonstrates the need for the inclusion of R&D investment. In New Zealand and Australia, much of the increased dividend payment appears to have come from a decrease in R&D investment. Thus, if a country decides to decrease shareholder-level dividend taxes and the country values investment in R&D, it may need to consider simultaneously increasing the R&D investment incentive.

INTRODUCTION

The role shareholder-level taxes play in corporations' decisions to pay dividends is still debated in academic research. Since Black (1976) posed the questions of why corporations pay dividends given their tax disadvantages and why investors appear to pay attention to them, researchers have tried to explain corporations' dividend policies (McKenzie and Thompson, 1997; Miller and Scholes, 1978). Poterba and Summers (1985, 1) reiterate Black's ideas, and they demonstrate that when governments tax corporate profits at the corporate level and again when they are distributed to shareholders as dividends, corporations should not pay dividends. Shareholders should prefer that corporations retain earnings where they can continue to be invested by the corporation and increase the corporation's value (Poterba and Summers, 1985). Since paying dividends is common among U.S. corporations, corporate dividend policy is obviously not this straightforward (Poterba, 1987; John and Williams, 1985; Poterba and Summers, 1985).

Three perspectives on how shareholder-level taxes affect firms' corporate dividend policy dominate the literature: the tax irrelevance view, the tax capitalization (or residual) view, and the double taxation view (McKenzie and Thompson, 1997; Zodrow, 1991; Poterba, 1987; Poterba and Summers, 1985). These three views differ as to why corporations pay dividends, how dividend taxes at the shareholder-level affect dividend payment, and what changes in shareholder-level dividend tax policy mean for corporate investment.

Utilizing natural experimental settings in Australia and New Zealand, this paper demonstrates that the R&D investment and dividend payments vary according to the country's tax incentives for R&D investment and taxation of dividend payments. The results support the double taxation and tax irrelevance views in dividend-paying firms operating in a tax regime with dividend imputation and capital gains taxes. This paper also documents significant decreases in R&D investment when a tax regime provides dividend implementation but does not provide explicit incentives for R&D investment. Thus, if a country decides to decrease shareholder-level dividend taxes and the country values investment in R&D, consideration should be given to simultaneously increasing the R&D investment incentive. Current dividend policy views do not include R&D investment in their predictions, and researchers tend to add it to capital investment to determine a firm's overall investment. This paper documents the importance of looking at R&D investment separate from capital investment.

This paper proceeds by further explaining the tax changes in New Zealand and Australia. It then reviews each of the three corporate dividend policy views. A literature review of the three corporate dividend policy views then demonstrates that the evidence is inconclusive. The hypotheses are developed and followed by a discussion of the data and analysis. Lastly, the results are presented and implications of the paper and its findings are discussed.

COUNTRY SETTINGS

Effective July 1985, Australia implemented R&D super-deductibility which permitted companies to deduct 150 percent of their R&D cost if the total annual R&D expenditure was greater than 20,000 Australian dollars and the company registered with the Industry Research and Development Board (Parliament of Australia: Senate Committee Report on Business Taxation Reform, 1999). As shown in Table 1, Panel A, prior to July of 1985, firms were permitted to deduct 100 percent of R&D. In July 1987, Australia implemented an incentive for dividend payments known as a dividend imputation credit (Table 1, Panel B). A dividend imputation credit reduces the double taxation of dividends by providing shareholder-level tax credits for dividends received or decreased shareholder-level dividend tax rates. The dividend tax credit enabled shareholders to receive a credit known as a "franking credit" for the portion of dividends paid out of a company's after-tax profit or "franked dividends" (Petty et al., 2000, 30). Although Australia refers to its imputation credit as a franking credit, to be consistent with the terminology in the literature, this paper continues to refer to it as an imputation credit. Thus, shareholders calculated their imputed credit on fully-franked dividends as follows:

$$\text{Imputation Credit} = \frac{\text{Dividends} * \text{Company tax rate}}{1 - \text{Company tax rate}}$$

Shareholders report the amount of the "franked dividend" they receive plus the imputation credit in their gross incomes (where the addition of the imputation credit "grosses up" the dividend received to a before-tax amount). They then claim the imputation credit against their tax liability (Petty et al., 2000, 31). For example, in 1988 when the maximum corporate and individual tax rates were both 48 percent, without dividend imputation, an Australian individual receiving a dividend of $100 from an Australian corporation in the 48 percent tax bracket would have reported $100 in gross income and been liable for $48.00 in taxes. However, with dividend imputation, the individual reported not only the $100 in gross income but also the $92.31 imputation credit, calculated according to the above equation. The resulting $192.31 total increase in gross income, increased the individual shareholder's tax before credits by $92.31 (i.e. $192.31 times 48 percent individual tax rate). This $92.31 tax liability is fully offset when the $92.31 imputation credit is applied against it. Thus, the individual effectively received the $100 dividend from the corporation free of additional tax.

As summarized in Panel B of Table 1, Australia also added an individual-level capital gains tax in July 1987. Prior to this date, individuals only paid tax on the gain from selling shares if they held the shares less than 12 months. Since July 1987, when individuals hold shares over one year, they pay tax on the difference between the sale price and the shares' cost, indexed for inflation. They then include this gain in gross income where it is taxed at regular rates. However, shareholders no longer pay tax on fully-franked dividends they receive while holding the stock (Thomas and Sellers, 1994, 87).

Prior to April of 1988, New Zealand taxed individual residents' worldwide taxable incomes, including dividends, at a three-rate scale of 15, 30, and 48 percent (Cameron, 1996). In April of 1988, the three-rate scale on individual residents' worldwide incomes was reduced to a two-rate scale of 24 and 34 percent. As Panel C of Table 1 shows, corporate rates also fell from 48 to 33 percent (Brash, 1996). At this time, New Zealand also implemented a dividend imputation credit (Prevost et al., 2002, 1100).

Similar to Australia's dividend imputation credit, New Zealand residents include dividends received plus the corporate tax on these dividends (i.e. gross-up amount) in gross income. They then offset their individual tax liabilities with the tax the corporation has already paid, i.e. imputation credit (Prevost et al., 2002, 1081). Prior to 1988, New Zealand permitted corporations a 100 percent deduction for R&D expenditures. While the tax changes in 1988 did not alter the R&D deduction, the 15 percent reduction in the maximum corporate tax rate reduced the value of deducting R&D expenditures (Brash, 1996). For example consider a firm with an income of $20,000 before their R&D expense of $1,000. Prior to the tax change the firm would save $480 ($1,000 * .48) in taxes via the R&D deduction; after the tax change the same amount of R&D expense, $1,000, would only save the firm $330 ($1,000 * .33) in taxes.

The settings in Australia and New Zealand provide unique opportunities in which to test the relationship between R&D investment and dividend payment. Australia went from a tax

regime without tax incentives for R&D investment or dividend payment to a tax regime with a tax incentive only for R&D investment and then to a tax regime with tax incentives for both R&D investment and dividend payment. New Zealand went from a tax regime without tax incentives for R&D investment or dividend payment to a tax regime offering a tax incentive for dividend payments. New Zealand did continue its 100 percent deduction of R&D. However, Thomas et al. (2003) did not classify countries with only a 100 percent R&D deduction as ones offering incentives for investment in R&D. For comparability, I use the same classification approach.

Table 1: Summary of Australian and New Zealand Tax Changes		
Panel A: Tax Changes in Australia (effective July 1985)		
	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 100 percent of investment	Immediate deduction for 150 percent of investment
Dividends Received	Taxed fully at shareholder level	Same
Capital Gains Realized	Taxed at individual rates only if held for less than 12 months; otherwise, no tax applied	Same
Panel B: Tax Changes in Australia (effective July 1987)		
	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 150 percent of investment above $20,000 AUS	Same
Dividends Received	Taxed fully at shareholder level	Credit for the portion of the dividend on which the corporation had already paid tax ("franked dividend")
Capital Gains Realized	Taxed at individual rates only if held for less than 12 months; otherwise, no tax applied	Taxed at the individual tax rate on the difference between the consideration received and the indexed cost base
Panel C: Tax Changes in New Zealand (effective April 1988)		
	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 100 percent of investment	Same
Dividends Received	Taxed fully at shareholder level	Credit for the portion of the dividend on which the corporation had already paid tax
Top Corporate Tax Rate	48 percent	33 percent

CORPORATE DIVIDEND POLICY VIEWS

The three views explaining why corporations pay dividends, the tax irrelevance view, the tax capitalization view and the double taxation view, differ in the calculation of the corporation's

cost of capital and the components included in this calculation. This difference leads to varying predictions in the event of a change in shareholder-level dividend taxes. This section reviews each corporate dividend policy view's calculation of corporate cost of capital and prediction of alterations in behavior following a change in shareholder-level dividend taxes. Table 2 summarizes the implications for firms under each scenario according to each of the three corporate dividend policy views.

Table 2: Tax Change Implications for Firms Typically Paying Dividends			
Panel A: Given No Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit			
	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	---------	Increase	Increase
Panel B: Given No Explicit Incentive for R&D Investment, the Effect of a Decrease in Corporate Tax Rates			
	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	---------	Increase	---------
Tax Capitalization	---------	Increase	---------
Double Taxation	---------	Increase	Increase
Panel C: Given an Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit			
	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	---------	Increase	Increase
Panel D: Given a Dividend Imputation Credit and an Explicit Incentive for Investment in R&D, the Effect of Capital Gains Tax on Firms			
	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	---------	Decrease	---------
Double Taxation	---------	---------	---------
Indicates no prediction. According to the dividend policy view, the variable could increase, decrease, or remain the same.			

Tax Irrelevance View

In the tax irrelevance view investors do not demand that corporations pay greater returns on equity instruments when shareholder-level dividend tax rates or capital gains tax rates decrease. Instead investors with similar tax characteristics form tax clienteles. For example, individuals or institutions with low shareholder-level dividend tax rates (or MTRs) hold stocks

with high dividend payments. Likewise investors facing high shareholder-level dividend tax rates will hold stocks with low dividend payments. Due to uncertainty, investors also hold some stock inconsistent with their tax-preferred dividend payment for diversification. Thus, a "marginal investor clientele" forms which is indifferent between receiving dividends or capital gains. The marginal investor is the investor who determines the market price of the securities under consideration. Under the tax irrelevance view this is the investor whose marginal tax rates on dividends and capital gains are virtually equal (Poterba and Summers, 1985, 11). Further, as clarified below, the effective shareholder-level dividend tax rate and capital gains tax rate of these marginal investors is zero (Poterba and Summers, 1985; Miller and Scholes, 1978; Miller and Modigliani, 1961).

Miller and Scholes (1978), proponents of this view, argue that all personal taxes can be effectively laundered. For example, a marginal investor who is selling stock at a loss will also sell stock with a gain, bringing his effective capital gains rate to zero. Further, a marginal investor consisting of a pension fund, university, or charity pays no tax and, thus, has a zero tax rate on both shareholder-level dividends and capital gains. Since the effective shareholder-level dividend and capital gains tax rates for the marginal investor are zero, the return to the marginal investor for one dollar initially invested is the return on the investment after corporate-level taxes. Neither the shareholder-level dividend tax rate nor the capital gains tax rate factor into the corporation's cost of equity capital. Since a permanent change in shareholder-level dividend taxes or capital gains taxes will not result in a change in the corporate cost of equity, corporate investments and dividend payment policies will not change.

Tax Capitalization View

The tax capitalization view states that shareholder-level dividend taxes are an additional tax on corporations' profits, and thus shareholders capitalize future dividend taxes into share values (Auerbach, 1979; King, 1977). Corporations only pay dividends when they have cash remaining after paying all other obligations and it is the only method for them to distribute this trapped equity. Since an alternative tax-advantaged method of distributing the income does not exist, corporations finance dividends with this remaining or residual cash. In other words, dividends do not signal the market; they merely return trapped equity to stockholders (McKenzie and Thompson, 1997; Zodrow, 1991; Poterba and Summers, 1985).

These firms continue to use retained earnings for corporate investment until investors are indifferent between reinvesting within the firm and receiving additional dividends. Not paying dividends defers the tax on the corporation's earnings from the original investment and causes stock price appreciation. This tax deferral offsets the later shareholder-level dividend tax (Zodrow, 1991, 500; Poterba and Summers, 1985, 15). In other words, the after-tax appreciation of the stock equals the after-tax value of foregone dividends. For instance, if a corporation uses one dollar for new investment, instead of paying one dollar in dividends, the shareholder does

not have to pay the shareholder-level dividend tax and thus saves an amount equal to the shareholder-level dividend tax rate. However, the reinvested one dollar will increase the stock price causing the shareholder to pay a capital gains tax. In equilibrium, the cost to the shareholder of the corporation investing one dollar instead of paying one dollar in dividends equals the value of the new investment, q^N, which is reflected in the stock price as follows:

$$q^N = (1 - \text{Shareholder - Level Dividend Tax Rate}) + (\text{Capital Gains Tax Rate})(q^N) \quad (1)$$

where (1- Shareholder-Level Dividend Tax Rate) is the after-tax dividend the shareholder would have received if the corporation had paid dividends and (Capital Gains Tax Rate)(q^N) is the capital gains tax the shareholder pays as a result of the increase in stock price the new corporate investment causes. Rewriting equation (1) in terms of the value of the corporate-level investment of one dollar in equilibrium results in the following:

$$q^N = \frac{1 - \text{Shareholder - Level Dividend Tax Rate}}{1 - \text{Capital Gains Tax Rate}} \quad (2$$

Whether the corporation pays a dollar of dividends or uses it for corporate investment, the value to the shareholder of each initial dollar invested in the company is the same, and thus dividend tax policy plays a role in the value of the corporation but does not influence corporate investment.

To demonstrate this, consider two scenarios, one in which the corporation pays dividends and one in which it foregoes paying dividends for corporate investment. In both cases the individual initially owns 50 shares of stock, each valued at $1.40, giving him a total stock value of $70. The shareholder-level dividend tax rate is 46 percent, and the capital gains tax rate is 10 percent.

Scenario A: The corporation pays a cash dividend of $1 per share.

Since the dividend is paid and not used for corporate reinvestment, the value of the stock does not change. The individual pays $23 in shareholder-level dividend taxes [($1 dividend per share) (50 shares) (0.46 dividend tax rate)], receives $27 after shareholder-level dividend taxes [($1 dividend per share) (50 shares) – $23 shareholder-level dividend tax], and holds a total of $70 worth of stock.

Scenario B: Instead of paying the $100 dividend, the corporation uses it for new investment.

In accordance with equation (2), the corporate investment will cause the stock price to increase by $0.60 per share [($1 foregone dividend) (1 – 0.46 shareholder-level dividend tax rate) / (1 – 0.10 capital gains tax rate)]. The individual will pay a capital gains tax of $3 [($0.60

share price increase) (50 shares) (0.10 capital gains tax rate)]. The individual now owns 50 shares worth $2 each ($1.40 original stock price + $0.60 increase in stock price), for a total stock value of $100. Now, suppose, the individual decides to sell stock equal to his overall stock value increase of $30 [($0.60 increase in stock price)(50 shares)]. Since his shares each have a value of $2, he sells 15 shares. This leaves him with $70 worth of stock [($2 per share) (50 initial shares – 15 sold shares)]. The total value of the stock, $70 is now the same as it was in Scenario A when the corporation paid a $1 dividend instead of investing it. Further, the total amount the shareholder has received is $27 [($30 from stock sale) – ($3 capital gains tax)], the same amount received in Scenario A.

To summarize the total distribution the individual in Scenario A receives is $27 ($1 dividend * 50 shares - $1 * 50 shares * 0.46 shareholder-level dividend tax rate) which equals the total distribution the individual in Scenario B receives after selling the portion of stock equal to the capital gain:

$$\left[\frac{(1-0.46\ \text{Shareholder - Level Dividend Tax Rate})}{(1-0.1\ \text{Capital Gains Tax Rate})}\right] * 50\text{shares} - \$3\ \text{Capital Gains Tax} = \$27$$

Now suppose that instead of selling the 15 shares in Scenario B, the individual continues to hold all 50 shares and the corporation pays as dividends all after-corporate-level tax returns from the new capital investment. The individual will receive the return on the investment, less corporate tax and shareholder-level dividends taxes. The individual will be content with this after-tax return as long as it is greater than or equal to the initial cost of each dollar of investment, q^N , as defined in equations (1) and (2). Each period the individual's after-tax return will be determined by the rate of return of the new corporate investment, the corporate tax rate and the shareholder-level dividend tax rate. Again, the individual will expect this after-tax return to equal the initial cost of the investment, q^N, leading to the following equation:

$$q^N = \frac{1 - \text{Shareholder - Level Dividend Tax Rate}}{1 - \text{Capital Gains Tax Rate}} = \tag{3}$$

$$\text{Before - Tax Rate of Return} * (1 - \text{Corporate Tax Rate}) * (1 - \text{Shareholder - Level Dividend Tax Rate})$$

As you can see, the shareholder-level dividend taxes in equation (3) cancel out, demonstrating that the level of corporate investment is influenced only by corporate tax rates and capital gains tax rates. Rewriting equation (3) reveals that the value to the individual of the return per initial dollar invested is as follows:

$$q^N = (\text{Before - Tax Rate of Return})(1 - \text{Corporate Tax Rate})(1 - \text{Captial Gains Tax Rate}) \tag{4}$$

Thus, while a permanent change in shareholder-level dividend tax rates will increase the price of the stock, unless coupled with a change in capital gains tax rates, it will not result in a change in corporate investments or dividend payment policies (Poterba and Summers, 1985).

Double Taxation View

Similar to tax capitalization view, the double taxation view contends that shareholder-level dividend taxes are an additional tax on corporate profits. The shareholder's after-tax return is calculated in equation (5):

$$\text{Shareholder-Level After Tax Return} = [(\text{Before Tax Rate of Return})(1 - \text{Corporate Tax Rate})] * [(\text{Dividend Payment Rate})(1 - \text{Shareholder-Level Dividend Tax Rate}) + (1 - \text{Dividend Payment Rate})(\text{Capital Gains Rate})] \quad (5)$$

The twist is that the double taxation view holds that despite their tax disadvantage, shareholders reward corporations when they pay dividends by increasing the stock price. Note that this differs from the tax capitalization view that stock prices rise when corporations reinvest instead of paying dividends. Proponents of the double taxation view do not claim to know the reason for the increase in stock price but simply accept that the market rewards corporations when they pay dividends (Poterba and Summer, 1985; McClure, 1977). Therefore, as shown below in equation (6), the shareholder's required rate of return (corporations' cost of capital) depends on corporate taxes and the weighted average of shareholder-level dividend and capital gains taxes:

$$\text{Shareholder-Level After Tax Return} = [(\text{Before Tax Rate of Return})(1 - \text{Corporate Tax Rate})] * [(w)(\text{Dividend Payment Rate})(1 - \text{Shareholder-Level Dividend Tax Rate}) + (1 - w)(1 - \text{Dividend Payment Rate})(\text{Capital Gains Rate})] \quad (6)$$

where (w) is the weight shareholders place on dividend taxes, which depends on the dividend payout ratio. When dividend payout ratios are high, shareholders place less weight on shareholder-level dividend taxes (w) and more weight on capital gain taxes (1- w). This reduces the weighted average tax rate of dividends and capital gains and the shareholder's required rate of return. This lower weighted average tax rate of dividends and capital gains entices firms to pay dividends despite their tax disadvantages (Zodrow, 1991; Poterba and Summers, 1985). A decrease in shareholder-level dividend taxes decreases the amount corporations have to pay for the shareholder's after-tax dividend to remain constant. In other words the decrease in shareholder-level dividend taxes reduces the cost of paying dividends and receiving the increase in stock price. This motivates the corporation to increase the dividend payout ratio, decreasing

the weighted average tax rate of dividends and capital gains and increasing investment (Zodrow, 1991; Poterba and Summers 1985).

PRIOR RESEARCH

Prior research examines the three corporate dividend policy views in a variety of settings. The literature has not reached a consensus as to the correct view. The three views of corporate dividend policy, the tax irrelevance view, the tax capitalization view and the double taxation view, are not necessarily mutually exclusive. They could each hold true for certain corporations under certain conditions (Poterba and Summers, 1985, 2).

The first of the three corporate dividend policy views is the tax irrelevance view. Under this view, a corporation's decision to invest is independent of its decision to pay dividends (Miller and Modigliani, 1961). Miller and Scholes (1978) warn that many studies rely on short-term responses to dividends when testing the relationship between taxes and dividend yield or the relationship between taxes and rate of return. As a result, findings that do not support the tax irrelevance view often are suspect. They demonstrate that dividend announcement effects, which also increase rates of return in the short run, bias these studies by creating short-term price increases.

The tax irrelevance view assumes operation in perfect capital markets; everyone in the market has the same expectations of future earnings and amount of risk involved. In other words, everyone participating in the market has the same information set (Mougoue and Mukherjee, 1994). But, researchers have found evidence that managers have superior information regarding their corporations. Since information asymmetry exists, dividends provide a signal to the market (Bhattacharya, 1979; Ross, 1977).

The tax irrelevance view also assumes transaction costs and taxes do not exist (Mougoue and Mukherjee, 1994). However, Easterbrook (1984) contends that not only do taxation costs exist but agency costs also influence dividend payments. Managers are imperfect agents of investors, and paying dividends helps to restrict their discretion.

The second corporate dividend policy view, the tax capitalization view states that despite the fact that shareholder-level dividend taxes are an additional tax on corporations' profits, shareholders capitalize future dividend taxes into share values. The after-tax appreciation of the stock equals the after-tax value of foregone dividends. Thus, a permanent change in dividend taxation, unless coupled with a change in capital gains taxation, will not result in a change in corporate investments or dividend policies (Poterba and Summers, 1985, 15; Zodrow, 1991, 500).

Looking at the financing choices of corporations, Masulis (1980) finds that stock prices increase when corporations exchange debt for equity and decrease when corporations exchange equity for debt. In his opinion, this supports the tax capitalization view: when debt replaces equity, stock prices increase because they now incorporate future dividends into the price.

Contrary to Masulis' study (1980), Myers-Majluf's theory (1984) predicts the opposite: corporations tend to issue equity when their shares are over-valued. Consistently, Masulis and Korwar (1986) and Vermaelen (1981) find that new stock issues lower stock prices while repurchases raise stock prices.

Elton and Gruber (1970) argue in favor of the tax capitalization view by showing that stock prices fall on ex-dividend days. The stock price falls because the dividend is no longer included in the stock price. Eades et al. (1984) refute this finding by demonstrating that stock dividends, which are not subject to a shareholder-level tax, produce similar results in the stock prices on ex-dividend dates.

Fama and French (1997) also look for evidence in support of the tax capitalization view using asset pricing models. If the tax capitalization hypothesis is true, they expect a negative relationship between corporate value and dividend payments. When a corporation pays dividends, the payout should no longer be included in the firm's future value; thus, the stock price should decline. Instead, they find a positive relationship between firm value and dividends and a negative relationship between leverage and value. They conclude that dividends and debt convey information to the market about profitability that is not captured elsewhere.

This potential for dividend signaling and the restriction of manager discretion is incorporated into the third view, the double taxation view (Poterba and Summers, 1985; McClure, 1977). Similar to dividend tax capitalization, this view contends that shareholder-level dividend taxes are an additional tax on corporate profits. The double taxation view holds that despite their tax disadvantage, shareholders still reward corporations when they pay dividends by increasing the corporate value (Poterba and Summers, 1985; McClure, 1977). The higher the dividend payout ratio, the lower the weighted average tax rate of dividends and capital gains, and the lower the shareholder's required rate of return (Zodrow, 1991; Poterba and Summers, 1985).

Using British data before and after changes in the way Great Britain taxes corporate retained and distributed income, Poterba and Summers (1985) find that the double taxation view is the closest match to their results and reject both the tax irrelevance and tax capitalization views. Their results show that changes in dividend taxation significantly impact ex-dividend price movements. Dhaliwal et al. (2003) also use the Revenue Reconciliation Act of 1993 to investigate the effects of the increase in the highest individual tax bracket on stock prices. They document a positive relationship between dividend yield and long-term stock returns which is mitigated by institutional ownership which supports the traditional double taxation view.

HYPOTHESES

This paper examines a shareholder-level dividend tax in two countries which have different tax treatments for R&D investment and which change their shareholder-level dividend tax policies over the time period investigated. Since firms often deduct R&D in the year incurred, R&D investment is tax favored in comparison to capital investment. Additional R&D

tax incentives come in a multitude of guises. Tax regimes can offer R&D tax credits based on flat rates (Canada), R&D tax credits based on incremental rates above a base (France, Japan, Spain, and the United States), or super-deductibility (more than 100 percent) of R&D expenses (Austria and Australia). Researchers still debate the effectiveness of R&D tax incentives in increasing R&D investment and the organizational factors influencing this investment (Hoskisson and Johnson, 1992; Goel, 1990; Hill and Snell, 1989; Bradley et al., 1984; Link and Long, 1981).

In July of 1985, Australia implemented an R&D investment tax incentive in the form of super-deductibility. Super-deductibility permitted companies to deduct 150 percent of their R&D expenses. While New Zealand did not offer an explicit tax R&D incentive, R&D expenses were 100 percent deductible. I use the same classification approach as Thomas et al. (2003) and do not classify countries with only a 100 percent R&D deduction as countries offering incentives for investment in R&D. During this study, both New Zealand and Australia also begin taxing corporate profits only once through dividend imputation credits. Though countries can implement such credits in a variety of ways, the net effect of a dividend imputation credit is to reduce the double taxation of dividends by reducing the tax shareholders pay on dividend income they receive. Table 3 summarizes these changes and defines the four tax regimes.

Table 3: **Tax Regimes**

	Time Period	R&D Investment Incentive	Dividend Payment Incentive
Tax Regime I	Australia prior to July 1985 New Zealand prior to April 1988	No	No
Tax Regime II	Australia from July 1985 to June 1987	Yes	No
Tax Regime III	New Zealand after March 1988	No	Yes
Tax Regime IV	Australia after June 1987	Yes	Yes

Effect of Dividend Imputation in the Absence of Explicit R&D Incentives

The dividend policy views vary in their predictions of the effects of a dividend imputation credit. As summarized in Table 2, Panel A, the tax irrelevance view predicts that dividend imputation credits will not change the dividend payment or the relationship between R&D investment and dividend payment. Similarly, the tax capitalization view states that any change in the dividend payment is the result of a change in the firm's corporate investment opportunities; thus, a dividend imputation credit will not change the firm's corporate investment policy.

Only the double taxation view of dividend policy suggests that a change in the way dividends are taxed will alter the dividend payment. According to this view, the market rewards dividend-paying firms by increasing stock prices when firms pay dividends. A decrease in the dividend tax decreases the amount of pre-tax dividend necessary for shareholders to receive the same after-tax dividend. This reduction in the cost of equity capital reduces the firm's cost of receiving the market's reward of an increased stock price. Thus, capital investment and the dividend payout ratio will increase (Poterba and Summers, 1985, 4). As mentioned earlier, prior

corporate dividend policy research does not address R&D investment alone. Instead it either includes it as part of capital investment or excludes it completely. Thus, the double taxation view of corporate dividend policy does not predict a direction for the change in R&D investment (Table 2, Panel A). Following a decrease in dividend taxes, the increases in the capital investment and dividend payment predicted by the double taxation view have to be funded by either the decrease in the average cost of capital, newly raised capital or as suggested by Thomas et al. (2003), a decrease in R&D investments. New Zealand's 1988 tax change provides a setting in which to explore these relationships and dividend views.

In 1988, New Zealand changed its tax regime from one offering tax incentives for neither R&D investment nor dividend payment to one offering tax incentives for paying dividends. New Zealand did continue to offer immediate deduction of 100 percent of the R&D expenses. To be consistent with prior literature, the 100 percent deduction is not classified as an explicit incentive to invest in R&D. According to Thomas et al. (2003), after this change, New Zealand firms that typically paid dividends should have now found paying dividends more attractive than investing in R&D. At this time, New Zealand also decreased its highest corporate tax rate by 15 percentage points (from 48 to 33 percent). This reduced the tax benefit of the implicit incentive for R&D investment, making the incentive for the payment of dividends even stronger. This does not alter the predictions under the double taxation view. However, corporate tax rates affect the cost of capital calculation under both the tax irrelevance and tax capitalization views of corporate dividend policy. Reducing the cost of capital results in an increase in capital investments according to both of these views (McKenzie and Thompson, 1997; Zodrow, 1991; Poterba and Summers, 1985; Miller and Scholes, 1978). Panels A and B of Table 2 summarize the effects these tax changes should have on dividend-paying firms and their R&D investment, capital investment, and dividend payment according to the three views of how dividend taxes affect corporate dividend policies.

Defining Tax Regime III as providing only a tax incentive for dividend payment (Table 3), the first hypothesis is as follows:.

H1a *When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will alter their R&D investment.*

H1b *When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will increase their capital investment.*

H1: *When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will increase their dividend payment.*

Effect of Dividend Imputation in the Presence of Explicit R&D Incentives

Australia's 1987 tax change also provides a setting in which to test the relationships among the uses of firm resources and the views of what affects corporate dividend policy. In July of 1987, Australia altered its tax regime from one offering tax incentives only for R&D

investment (defined as Tax Regime II in Table 3) to one offering tax incentives both for R&D investment and dividend payments (defined as Tax Regime IV in Table 2). According to the double taxation view, the implementation of a dividend imputation credit will directly impact the payment of dividends in dividend-paying firms (Table 2, Panel C). The dividend imputation credit allows firms to pay less in dividends while shareholders receive the same after-tax dividend payment. The reduced equity costs make paying dividends and capital investments attractive uses of firm resources (Poterba and Summers, 1985, 4).

At this time, Australia also implemented a capital gains tax. A capital gains tax would not cause a change in the dividend payment or investment policy under the tax irrelevance view. The tax capitalization view contends that implementing a capital gains tax will decrease the after-tax appreciation shareholders receive when they sell their stock (Table 2, Panel D). In turn, this will increase the cost of capital and discourage capital investment (McKenzie and Thompson, 1997, 9). Under the double taxation view, the cost of capital depends on a weighted average of shareholder-level dividend taxes and capital gains taxes. An increase in capital gains taxes alone would increase a firm's cost of capital. This increase in the cost of capital would decrease investments and dividend payout ratios. However, when coupled with dividend imputation which as discussed above, has the opposite effect on the cost of capital, it is not possible to predict the movement in R&D investment, capital investment, or dividend payment.

H2a *When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will alter R&D investment.*

H2b *When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will increase capital investment.*

H2c *When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will increase dividend payment.*

DATA AND METHODOLOGY

To test the hypotheses, I examine pooled cross-section firm-year Australian and New Zealand data from the fiscal year ending 1982 to the fiscal year ending 1993. Where available, the data comes from the Worldscope Global Researcher Database via Thompson Financial and Datastream Advance 4.0. The remainder of the data is hand-collected from the Australian Graduate School of Management Annual Report File and the Australian Stock Exchange annual reports housed in Perth, Western Australia. Only domestic dividend-paying firms are kept in the sample since these are the firms which will be most affected by a tax change in their country. Consistent with Thomas et al. (2003), this paper defines domestic firms as those with (1) less than 50 percent of their total sales due to foreign sales, (2) less than 50 percent of their total assets located abroad, and (3) less than 50 percent of their total income due to foreign income. The complete sample contains 498 firm-year observations.

In each case, I deflate R&D expense and capital expenditures by size. I deflate dividend payment by earnings. To test each hypothesis, I use the nonparametric Wilcoxon-Mann-Whitney test. I run the Wilcoxon-Mann-Whitney test because Bartlett's test for equal variances rejects the null hypothesis of equal variances in the each of the deflated variables, and thus the parametric t-test would not be appropriate. I use a two-tailed test when the hypothesis is non-directional and a one-tailed test when the hypothesis is directional.

RESULTS

The first hypothesis investigates actions of dividend-paying firms moving from Tax Regime I to Tax Regime III—New Zealand before and after dividend imputation. H1 compares the amounts of dividend payment, capital investment, and R&D investment in Tax Regime II with Tax Regime IV, to determine the dominant dividend policy view. Using the nonparametric Wilcoxon-Mann-Whitney test to investigate H1a reveals that R&D expense deflated by size changed (decreased) significantly ($z = 1.80$, $p = 0.0714$) after dividend imputation. Running the same test on capital expenditures, deflated by size and dividend payment, deflated by earnings investigates H1b and H1c. The results do not show a significant change in the median of capital expenditures; thus, H1b is not supported. However, they do indicate a marginally significant increase in dividend payment ($z = -1.25$, $p = 0.10$) after dividend imputation, supporting H1c. When New Zealand moved from Tax Regime I to Tax Regime III, it also lowered its corporate tax rate. As Table 2, Panel B shows, all of the corporate dividend policy views predict that R&D investment could change and that capital expenditures should increase after moving from Tax Regime I to Tax Regime III. Further while the double taxation view suggests that dividend payment should increase, the other two views also hold that it may. Since capital investment did not increase, the results cannot support one corporate dividend policy view over another.

The second hypothesis compares dividend-paying firms operating under Tax Regime II with those operating under Tax Regime IV—Australia before and after the implementation of dividend imputation. H2 focuses on changes in investments and dividend payments to investigate the corporate dividend policy views. Running the Wilcoxon-Mann-Whitney test on R&D and capital investment deflated by size and dividend payment deflated by earnings investigates the changes in these variables between the two tax regimes. None of these tests detect significant changes in the medians of these variables when operating under Tax Regime II versus Tax Regime IV. Table 2, Panel D, contains the predictions of the corporate dividend policy views.

The tax irrelevance view predicts no changes in R&D investment, capital investment, or dividend payment. According to the tax capitalization view, R&D investment and dividend payment may increase. However, it also contends that the capital gains tax which was added under Tax Regime IV will decrease the after-tax appreciation shareholders receive when they sell their stock—increasing the cost of capital and decreasing capital investment. The double taxation view does not provide a prediction for the change since dividend imputation and capital gains affect the cost of capital in opposite directions. Thus when comparing the behavior of

dividend-paying firms in Tax Regime II to those in Tax Regime IV, I find support for only the tax irrelevance and double taxation views.

IMPLICATIONS

This paper highlights a void in the current corporate dividend policy views and shows the need for the inclusion of R&D investment. Traditionally these views have only considered capital investment, not R&D investment. This paper demonstrates that R&D and capital investments often move in opposite directions and that tax changes in shareholder-level dividend taxes affect the investment in R&D. Contingent on the R&D tax incentive in place, changes in shareholder-level dividend taxes may place pressure on firms to increase the amount of dividends paid while decreasing the amount of R&D investment. This study found that in both New Zealand and Australia, investment in R&D decreased after the implementation of dividend imputation.

Decreases in investment in R&D could have a negative effect on economic growth since research shows that domestic R&D spending is linked to the rate of innovation and the ability to learn from others (Cameron, 1996; Salter and Martin, 2001). While on the surface, the payment of dividends and R&D investment may seem unrelated, the results of this paper demonstrate this is not true. Therefore when a decrease in shareholder-level dividend taxes designed to stimulate economic growth is implemented, economic growth may be negated by a decrease in R&D investment.

Further, when investigating the results of a tax regime simultaneously ceasing to tax dividends at the shareholder-level and lowering corporate tax rates, I do not find support for any of the current corporate dividend policy views (Table 2, Panel A). I find that in dividend-paying firms, R&D investment and dividend payment change significantly. As shown in Table 3, Panel B, all three of the corporate dividend policy views predict an increase in capital investment. Since I do not find this, I cannot support one view over another in this setting.

However, when investigating the results of a tax regime simultaneously ceasing to tax dividends and implementing a capital gains tax (Table 2, Panel C), I find support for the tax irrelevance and double taxation views in dividend-paying firms. I do not find the significant decrease in capital investment predicted by the tax capitalization view.

More research is needed before the conclusions from this paper can be generalized to countries such as the United States. This is due primarily to the fact that unlike New Zealand and Australia during this paper's sample period, the United States permits share repurchases. When a country allowing share repurchases, implements a dividend payment incentive, funding for increased dividend payments may be drawn from funds previously used for share repurchases instead of from R&D investment funds. Therefore, future study in countries permitting share repurchases is needed before we can generalize the results of this paper to the United States.

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INTERACTION BETWEEN MONETARY AND FISCAL POLICY IN JORDAN

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ABSTRACT

This paper has investigated the dynamic interaction between monetary and fiscal policy in Jordan. The aim of this study is to evaluate how and to what extent both policies are responding to each other on one hand and to the movements in output growth and inflation on the other.

By employing the Vector Error Correction Model (VECM), this research confirms the perception that monetary policy and fiscal policy are relatively dependent. Concerning output growth, it shows no significant reaction to monetary contraction or deficit expansion. In contrast, a positive shock in the growth rate of output triggers a rise in the interest rate and a decline in the deficit.

As for inflation, it shows a significant reaction to deficit expansion or monetary tightening only after two to three quarters. Alternatively, a positive shock to inflation leads to an increase in both nominal interest rate and deficit.

INTRODUCTION

A large body of literature suggests that the discretionary regime of monetary and fiscal policy produces on average an inefficiently high amount of inflation and budget deficit. This suggests that optimal monetary and fiscal policy may be dynamically inconsistent.

Three approaches have been introduced in the literature to address the inconsistency problem. First is establishing an independent monetary policy with its main mandate centered on price stabilization (Rogoff 1985). Second is conducting monetary and fiscal policy by a technique centered on inflation and deficit targeting (Bernank and Mishkin (1996) and Sevensson (1997). Third is applying pre-set monetary and fiscal rules when responding to the state of the economy (Taylor, 1993, 2000), and McCallum (1997). Enhancing the credibility of both monetary and fiscal policy is a common theme of the three approaches.

Generally speaking, many studies have found an inverse relationship between monetary policy independence and average level/variability of inflation. Furthermore, a number of studies have found that targeting techniques and pre-set policy rules could improve welfare by lowering inflation and deficit. For other studies, however, the gains from monetary policy independence

have been examined in isolation from the actions of the fiscal policy. And, it is argued that once the fiscal policy actions are taken into account, the goal of stabilizing prices of monetary policy may cause some welfare loss--in the form of lower output and increased fluctuations in the state of the economy. However, beginning with Sims (1980), a parallel line of empirical research on the effect of monetary and fiscal policy within the context of macroeconometric models has been accumulated in the literature. Applying the different forms of Vector Autoregression (VAR) models has been the dominant methodology.

In fact, an enormous amount of work has been done on the macroeconomic effect of monetary policy within the context of VAR models. On the other hand, the work on fiscal policy has received relatively less consideration in the context of VAR empirical analysis. Even less attention has been devoted to estimating the dynamic interaction between monetary and fiscal policy.

This paper empirically examines the dynamic interaction between monetary and fiscal policy in Jordan, and thus fills a void in the literature particularly for emerging countries. The main focus of this paper is how and to what extent both monetary and fiscal policy responds over time to each other and to the movements in the state of the economy. The empirical analysis undertaken in our work was based on VAR analysis where Vector Error Correction Model (VECM) is suggested by the data. Generalized impulse response functions (GIRF) developed by Koop, Pesaran, and Potter (1996) and Persaran and Shin (1998) constituted the primary tools of analysis in this paper.

These tools of analysis were chosen to overcome the identification problem incorporated in the VAR model. It is important to note that solving the identification problem in modeling the interaction between monetary and fiscal policy amounts to imposing a number of restrictions on the effects of monetary and fiscal policy. In fact, there is a well-known common pattern in identifying the restrictions on the effects of monetary policy, but there is a critical lack of consensus about identifying restrictions on the effects of fiscal policy. Therefore, by using our techniques, we attempted to avoid imposing restrictions on the effects of monetary and fiscal policy. Likewise, the GIRF was chosen not only to detect the direction and the duration of the impacts and/or responses between monetary and fiscal policy (Enders (1995), but also to overcome the ordering problem for the selected endogenous variables.

The rest of this paper is organized as follows: in the next section, the selected variables used to study the mutual interaction between monetary and fiscal policy were introduced. Section 3 surveys some of the background discussions of the existing theoretical transmission mechanisms between the selected variables, and outlines some of the key predictions. Section 4 describes the empirical framework. Section 5 includes a discussion of the empirical results, and the last section contains the summary and conclusions.

THE SELECTED VARIABLES

THE THEORETICAL TRANSMISSION MECHANISMS

The Relationship between the Short-run Interest Rate and the Other Variables

The Role of Inflation

In the standard IS/LM analysis, a decrease in price level, given the nominal money supply, increases the real cash balances. Thus, a lower interest rate is needed to clear the money market. In modern Keynesian analysis, as a respond to higher inflation, the interest rate through the effects on aggregate demand and aggregate supply is expected to be higher. According to the standard interest rate rule specification, when inflation deviates from its target level, the nominal short-run interest rate should be higher than its trend. This setting is consistent with the Fisher hypothesis: when inflation increases, expected inflation adjusted upwards, thus nominal interest rate goes up.

The Role of Budget Deficit

Generally speaking, higher government borrowing requirements resulting from a growing budget deficit could lead to an increase in net credit demands in the economy. If this is accommodated by a sustained increase in money supply, this will probably increase the interest rate. This is known as the accommodation hypothesis. Moreover, a loanable funds model suggests that increases in government borrowing demand places upward pressures on interest rates. Standard arguments suggest that interest rates and budget deficit should be positively correlated. However, empirical evidence is still lacking.

The Role of Output

Traditional arguments suggest that when output increases, the demand for money also increases. Increases in the demand for money implies an increase in the supply of other assets, i.e., bonds, thereby causing bond prices to fall and the interest rate to rise. Additionally, with stronger output growth, businesses have a stronger demand for funds to finance new projects and consumers may save less if they anticipate their incomes to rise. Consequently, real output growth may place pressure on interest rate to rise.

The Relationship between the Government Deficit and the Other Variables

The Role of Inflation

The main arguments in the inflation-deficit link are: the Tanzi effect, the Patinkin effect and the Barro hypothesis. The central point of the Tanzi argument lies in the fact that the time of tax obligations' accrual and the time of actual payment do not match, with payment usually made at a later date. High inflation during such time lags may affect tax revenues, depending on the lag time. As for the Patinkin effect, high inflation actually has an impact not only on tax revenue but also on expenditures. Indexation could be used against these arguments, but because indexation is imperfect and linked to past inflation, the real effect of inflation on deficit may be an important factor in the direction of the deficit. With respect to the Barro hypothesis, the government may increase nominal deficit in order to keep pace with the rate of inflation.

The Role of Interest Rate

Generally, the interest rate-deficit links are organized in the literature under several effects. The expenditure effect says that higher interest rates may cause the level of output to be lower than expected. This may lead the government to increase output by expanding expenditures which leads to higher budget deficit. The revenue effect says that in the short run, higher interest rate may lead to slower output growth. If so, tax revenues might be reduced, thus leading to a rise in the government budget deficit.

The debt effect says that higher short-term interest rates may positively affect medium- and long-term rates. As a result, servicing even a constant level of government debt becomes more costly, and these costs may increase the deficit. On the other hand, this later issue may cause the government to decrease the total debt and expenditures if they find that they are positively related with interest rate, thus leading to a decrease in the deficit. Finally, based on the government budget constraint, the effect of interest rate on government deficit operates through the present value of aggregate investment spending, taxes, and interest payment on domestic and external debt. Higher interest rates reduce these present values. Thus, the evidence on the interest rate-deficit relationship is mixed.

The Role of Output

Given that the government desires to minimize the associated tax-revenue distortions on output, and given that such distortions increase with a higher tax rate, steady moderate tax-smoothing rates are a preferable form of tax policy. As a result, tax revenues are not compatible with government purchases. Thus, budget deficit may increase. On the other hand, in the

traditional analysis, higher output allows collection for more taxes, and results in less pressure on government to increase transfer payments to beneficiaries.

The Relationship between the Real Output and the Other Variables

The Role of Interest Rate

Given the microeconomic foundations of the temporary nominal price and/or wage rigidity, lowering the short-term nominal interest rate will decrease the cost of borrowing used to finance both firms' and households' purchases of investment and durable goods. As a result, planned aggregate expenditures and thus output are expected to increase.

In recent literature, investment decisions are generally viewed as more closely linked to medium- and long-term interest rates. That is, changes in the short-term interest rate will affect investment if longer-term rates are affected. According to the expectation theory of the term structure of interest rates, the longer-term rates are an average of current short-term rates and expected future short-term rates, which partly depends on inflation expectations. Therefore, as long as changes in short-term rates are not completely balanced by the expected inflation, real output is likely going to increase when the short- term interest rate decreases.

The Role of Inflation

Given some kind of market imperfection, the short-run relationship between inflation and output is primarily represented by the upward sloping aggregate supply curve. According to the three traditional models, the sticky-wage/price model, the worker-misperception model, and the imperfect-information model, the unexpected increase in inflation is associated with higher output. The main route of transmission is that inflation decreases the real wage, thus making it optimal for firms to demand more labor and increase the production of goods and services. Recently, the inflation output tradeoff has been formulated using the expectations-augmented version of the Phillips curve, i.e., output is higher than its natural level when inflation is higher than its expected level. In modern Keynesian theories, the expected level of inflation has different formulations with different implications on the inflation-output link.

By contrast, it has been argued that inflation may distort the consumption-leisure choice of households and may distort capital income on investment. Therefore, elimination of such distortion by reducing inflation would lead to a higher labor supply and more investment, resulting in higher levels of output. Consequently, various strategies have been suggested in the literature for achieving the goal of controlling inflation. Interest rate rules, inflation targeting and forward-looking preventative monetary policy[17] are examples of these strategies.

The Role of Budget Deficit

Note that deficit-financed expenditures directly increase the level of aggregate demand. By contrast, deficit-financed tax-cut and transfer payments increase aggregate demand indirectly as households adjust the level of their spending in accordance with changes in disposable income.

The conventional wisdom on the impact of deficit expansion is largely dominated by the Keynesian view where a mix of higher expenditures and tax reductions will increase the economy's aggregate expenditures and output. However, higher government borrowing requirements resulting from a growing budget deficit could lead to an increase in the net credit demands in the economy. The resulting excess demand on credit drives the interest rate up and then may crowd out private sector investment, hence lowering output. Thus, the net effect on output is ambiguous. In sharp contrast, for many empirical studies on some European Countries (e.g., Denmark, Sweden) during the 1990s, the deficit reduction was found to be expansionary in the form of higher output. Credibility of fiscal policies and long lags in government responses to shocks are among the arguments that explain the expansionary effects of deficit reduction.

The Relationship between Inflation and the Other Variables

The Role of Deficit

According to the standard Keynesian view, a government deficit stimulates aggregate demand, thus placing inflationary pressures on the economy. As for the monetarist analysis, deficits cause inflation if they are monetized. Sargent and Wallace (1981) argued that the accumulated government debt has to be monetized by the central bank. Thus, the money supply will be higher in the economy leading to inflation. According to the fiscal theory of price level determination, households' expectations about the present value of government deficit/surplus may increase inflation. A decrease in the present discounted value of expected future government surpluses increases current prices not only because of increasing the path of the expected inflation but also because of making households feel wealthier, which may increase aggregate demand and inflation (Woodford, 2001).

The Role of Output

Higher output necessitates higher employment and may lead to increases in wages and thus cost of production, both of which drive up inflation. Moreover, demand-led growth places inflationary pressures on the economy.

The Role of Interest Rate

A fall in the interest rate stimulates aggregate demand through firms' investment and consumers' purchases, particularly of durable goods. As a result, aggregate demand is higher, leading to inflationary pressures. Additionally, as the domestic interest rates falls, the exchange rate depreciates. A falling domestic currency raises net export and demand, which produces inflationary pressures.

THE EMPIRICAL FRAMEWORK

The Data

The VAR model consists of two macroeconomic (non-policy) variables and two policy variables. The macroeconomic variables are: inflation rate, based on the consumer price index (CPI), and real output, based on real gross domestic product (GDP). The policy variables are: overnight interbank rate (IR), defined as the interest rate at which commercial banks borrow overnight, and government budget deficit, measured as ratio to real gross domestic product (DF). CPI and GDP variables are converted to natural logarithms, while IR and DF are held in their level form. All variables based on quarterly data comprising 1996:Q4-2011:Q1. Data are driven from the Central Bank of Jordan, Monthly Statistical Bulletin. The four variables are depicted in Figure 1 and descriptive statistics for the variables are provided in Table 1.

Figure (1): Plot of the Sample Series, 1996:Q4-2011:Q1.

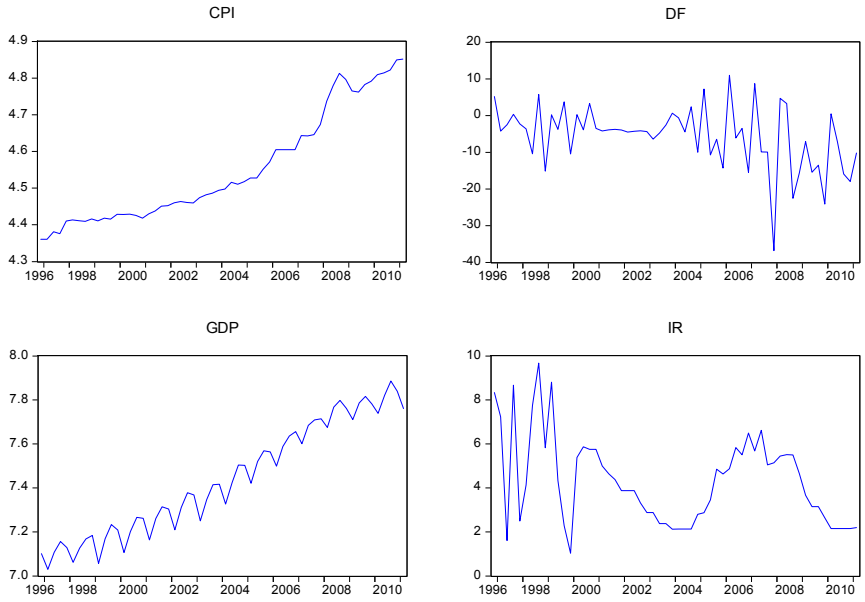


Table (1): Summary Statistics of the Natural Logarithm of Consumer Price Index (CPI), Natural Logarithm of Real Gross Domestic Product (GDP), Government Budget Deficit, Measured as Ratio to Real Gross Domestic Product (DF), and the Interbank Rate (IR), 1996:Q4-2011:Q1.

	CPI	GDP	DF	IR
Mean	4.5	7.4	-5.5	4.3
Median	4.5	7.4	-4.2	4.2
Maximum	4.8	7.9	11.8	9.7
Minimum	4.4	7.0	-36.8	1.0
Std. Dev.	0.1	0.2	8.5	2.0
Skewness[1]	0.7	0.2	-0.93	0.7
Kurtosis[2]	2.0	1.7	4.92	2.9
Jarque-Bera[3]	6.8	4.3	17.30	3.3
Probability	[0.03]	[0.1]	[0.00]	[0.12]

[1] Skewness $sk = 1/n\sum_{i=1}^{n}\left(\frac{y_i-\bar{y}}{\hat{\sigma}}\right)^3$: is a measure of asymmetry of the distribution of the series around its mean, $\hat{\sigma}$ is an estimator for the standard deviation.

[2] Kurtosis: $sk = 1/n\sum_{i=1}^{n}\left(\frac{y_i-\bar{y}}{\hat{\sigma}}\right)^4$ is a measure of the peakedness or flatness of the distribution of the series.

[3] jarque-Bera (1979), $JB = \frac{n-k}{6}\left[(sk)^2 + \frac{(ku-3)^2}{4}\right]$ is a test for the H_0: the series is normally distributed, where ku is skewness, ku is kurtosis, and k is the number of estimated coefficients.
The P-Value is in [ ].

The VAR Model

As pioneered by Sims (1980), the vector Autoregression (VAR) is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach treats every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The mathematical representation of a VAR(P) is Enders (2004):

$$Y_t = m + \alpha_1 Y_{t-1} + \ldots\ldots + \alpha_p Y_{t-p} + \varepsilon_t \ldots\ldots\ldots\ldots (1)$$

$$\begin{bmatrix} GDP_t \\ CPI_t \\ DF_t \\ IR_t \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{02} \\ \alpha_{03} \\ \alpha_{04} \end{bmatrix} + \begin{bmatrix} \alpha_{111} & \alpha_{112} & \alpha_{113} & \alpha_{114} \\ \alpha_{121} & \alpha_{122} & \alpha_{123} & \alpha_{124} \\ \alpha_{131} & \alpha_{132} & \alpha_{133} & \alpha_{134} \\ \alpha_{141} & \alpha_{142} & \alpha_{143} & \alpha_{144} \end{bmatrix} * \begin{bmatrix} GDP_{t-1} \\ CPI_{t-1} \\ DF_{t-1} \\ IR_{t-1} \end{bmatrix} + \ldots\ldots + \begin{bmatrix} \alpha_{11p} & \alpha_{12p} & \alpha_{13p} & \alpha_{14p} \\ \alpha_{21p} & \alpha_{22p} & \alpha_{23p} & \alpha_{24p} \\ \alpha_{31p} & \alpha_{32p} & \alpha_{33p} & \alpha_{34p} \\ \alpha_{41p} & \alpha_{42p} & \alpha_{43p} & \alpha_{44p} \end{bmatrix} * \begin{bmatrix} GDP_{t-p} \\ CPI_{t-p} \\ DF_{t-p} \\ IR_{t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix}$$

where Y_t is a k vector of endogenous variables $[GDP_t\ CPI_t\ DF_t\ IR_t]$, $\alpha_1, \ldots\ldots, \alpha_p$ are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables (Rukel, 2009).

Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and OLS yields consistent estimates. Even though the innovations ε_t may be contemporaneously correlated, OLS is efficient and equivalent to GLS.

The specific vector we considered in our research contains Y, = [IR, DF, Logarithm of CPI, Logarithm of GDP]. Thus, in our case, Y, is 4 x 1 vector of the endogenous variables, m is 4x1 vector of constants, α_1 are 4x4 matrices of lag coefficients of Y_t, up to some lag length P, and ε_t is 4x1 vector of shocks. The components of ε_t vector are each white noise process with zero mean, constant variance, and are individually serially uncorrelated. However, they could be contemporaneously correlated.

With this setting, the VAR model consists of four equations one for each endogenous variable. The interest rate equation may be described as an interest rate policy rule; the deficit equation could be described as an IS-type relationship. Output and inflation equations could be described as the adjustment mechanisms for the state of the economy when policy variables have changed. The lags included in the formulation of endogenous variables make the VAR a better tool for analyzing the process of monetary and fiscal transmission mechanisms. This latter point is based on the idea that monetary policy and fiscal policy take time to have effects on the macroeconomic outcomes.

Stationarity of the Variables

Running the VAR model using nonstationary variables will produce hazardous results (Sims, Stock, and Watson (1990). Therefore, we first checked for stationarity of the variables in their level form. The graphical representation in figure 1 suggests that the time series for all variables are not stationary. More formally, the augmented Dickey-Fuller (AD-F) unit root test was performed; the results are presented in Table 2, which shows that the hypothesis of unit root was not rejected for the four variables at the 5% level of significance. Hence, on the basis of the graphical analysis and Dickey-Fuller test all variables in their level form are nonstationary; i.e. contain a unit root.

Table (2): Augmented-Dickey-Fuller (AD-F) Unit Root Test Results of the Natural Logarithm of Consumer Price Index (CPI), Natural Logarithm of Real Gross Domestic Product (GDP), Government Budget Deficit, Measured as Ratio to Real Gross Domestic Product (DF), and the Interbank Rate (IR), 1996:Q4-2011:Q1.

Variable	ADF Results	
	With intercept	With Time
GDP	0.015	-2.48
CPI	0.55	-1.56
DF	-1.52	-2.73
IR	-2.25	-2.23

*, **, Denotes that the null hypotheses that the variable contains a unit root is rejected at1%, and 5%, significance level, respectively. The asymptotic critical values (with time) are: 1%, -4.1; 5%, -3.5; and the asymptotic critical values (with intercept) are: 1%, -3.6; 5%, -2.9. Since the distribution of the AD-F statistic is non-standard and requires the use of critical values tabulated by MacKinnon (1996).

Bringing together the facts that the variables are nonstationary in their level form, the standard econometric literature recommends transforming the variables to stationary series by first differencing. Since CPI and GDP variables are in natural logarithm, their first differences amount to percentage changes. As for the interbank rate and the deficit variables, their first difference amounts to policy changes.

Table (3): Results of Johansen's Cointegration Test on the Natural Logarithm of Consumer Price Index (CPI), Natural Logarithm of Real Gross Domestic Product (GDP), Government Budget Deficit, Measured as Ratio to Real Gross Domestic Product (DF), and the Interbank Rate (IR), 1996:Q4-2011:Q1.

Hypothesized No. of CE(s) [1]	Trace Statistic [2]	5% Critical Value	1% Critical Value
R=0	74.0	47.9	54.7
R=1	26.5	29.8	35.5
R=2	10.84	15.5	19.9
R=3	0.05	3.8	6.6
Hypothesized No. of CE(s)	Max-Eigen Statistic [3]	5% Critical Value	1% Critical Value
None	47.5	27.6	32.7
At most 1	15.67	21.1	25.9
At most 2	10.80	14.3	18.5
At most 3	0.05	3.8	6.6

[1]Stands for hypothesized cointegrating vectors.
[2]Denotes the trace statistics test.
[3]Denotes maximum eigenvalue statistic test

Table (4): Unit Root Test Results of the changes in: Natural Logarithm of Consumer Price Index (CPI), Natural Logarithm of Real Gross Domestic Product (GDP), Government Budget Deficit, Measured as Ratio to Real Gross Domestic Product (DF), and the Interbank Rate (IR), 1996:Q4-2011:Q1.

Test Variable	ADF[1]		p-p[2]	
	With intercept	With Time	With intercept	With Time
ΔGDP^2	-3.0**	-2.91**	-15.6*	-14.88*
ΔCPI^2	-5.6**	-5.61*	-5.4*	-5.47*
ΔDF^3	-12.81*	-7.98*	-39.5*	-39.8*
ΔIR^5	-4.9*	-4.86*	-12.71*	-12.54*

Δ denotes to the changes in the variables as defined in Table 1.
[1]AD-F: denotes the Augmented-Dickey-Fuller (1979).
[2]P-P: denotes the PhiIlips-Perron (1988).
*, **, and ***, denotes that the null hypotheses that a variable contains a unit root is rejected at 1%, 5%, and 10% significance level, respectively. Asymptotic critical values (with time) are: 1%, -4.1; 5%, -3.5; 10%, - 3.2; and the asymptotic critical values (with intercept) are: 1%, -3.6; 5%, -2.9; 10%, -2.6.

Both the AD-F and Phillips-Perron (P-P) unit root tests were performed on the first difference of the four variables (the first difference operator is denoted by Δ). As shown in Table 4, the hypothesis that there is a unit root was easily rejected at 1% level of significance for the variables ΔIR, ΔDF, and ΔCPI. ΔGDP index only passes the AD-F (with intercept) test at a 5%

level of significance, while when performing the P-P test, the hypothesis of a unit root test was rejected at 1% level of significance.

Given these results, our research proceeded with the assumption that the variables are integrated with the same order, i.e., I (1), and thus, all variables were entered into the VAR model based on their rates of change. The first differences of the four variables are depicted in Figure 2, and the descriptive statistics for the variables are provided in Table 5.

Figure (2): Plot of the Sample Series, 1996:Q4-2011:Q1.

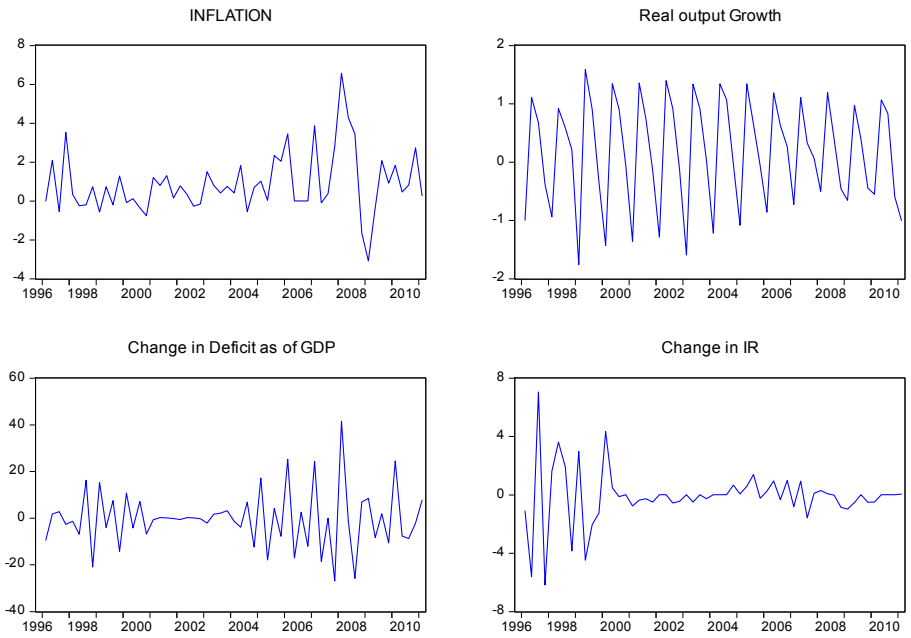


Table (5): Summary Statistics of the Sample Series Used in the VAR model 1996:Q4-2011:Q1.[1]				
	ΔCPI	ΔGDP	ΔDF	ΔIR
Mean	0.008	0.011	-0.26	-0.114
Median	0.005	0.020	-0.82	0.000
Maximum	0.063	0.112	41.49	7.060
Minimum	-0.031	-0.126	-26.8	-6.170
Std. Dev.	0.016	0.068	12.5	2.064
Skewness1	0.943	-0.317	0.61	0.047
Kurtosis1	5.32	1.662	4.44	7.094
Jarque-Bera1	19.26	4.03	8.48	39.126
Probability	[0.000]	[0.133]	[0.014]	[0.000]

[1]The definitions of the variables are reported in Table 1, the Δ denotes to the changes in the variables.

Cointegration

While (AD-F) and (P-P) suggest that the variables are nonstationary in their level form when considered individually, it is possible that these variables share a common stationary relationship. In this case, the variables are said to be cointegrated. In the presence of cointegration, it is necessary to estimate the VAR model in an error correction model form so as to avoid throwing away information concerning the comovement in the variables.

To check for evidence of cointegration, the Johansen's cointegration tests were performed, and the results are presented in Table 3. As shown by the table, both trace and max-eigenvalue rank tests indicate that the hypothesis of no cointegrating relations is rejected among the set of the variables at both 5% and 1% level of significance.

Generalized Impulse Response

Combining the facts that the variables are nonstationary series and cointegrated in their level form, a vector error correction (VEC) model is a restricted VAR designed for use with such case. The VEC has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

The impulse response functions can be used in the analysis of interactions between variables. Impulse response functions make it possible to study the impact of exogenous shocks on the variables. This allows the determination of the impacts of monetary policy and fiscal policy shocks as well as price and real output shocks. The maximum value of GIRFs represents the peak effect while the time horizon for the graph gave the timing of the variable effect on other variables.

Despite its popularity, the orthogonalized impulse response function (OIRF) analysis of structural vector autoregressive (VAR) models is subject to the so-called Wold-ordering problem. Pesaran and Shin (1998) propose an ordering-invariant approach, the generalized impulse response function (GIRF), based on the work of Koop et al. (1996).

THE EMPIRICAL RESULTS AND THE GENERALIZED IMPULSE RESPONSE FUNCTIONS

First difference of the variables was entered in the estimated VEC model and used to generate the GIRFs. Each variable was regressed on four lags of all endogenous variables over the period 1996:Q4-2011:Q1 with constant and without trend. The choice of four lags is

supported by Akaike's Information Criteron (AIC), Final Prediction Error (FPE) criterion and Schwartz Information Criterion (SC) as shown in Table 6. The estimated VEC (4) is reported in Table 7. The residuals of the system are plotted in Figure 3. Table 8 reports the stability test for the estimated model, suggesting that the VAR (4) satisfies the stability condition and converging with dampened oscillations. In fact this result bear a reasonable resemblance to the actual behavior of the economy as can be seen in Figure1. Thus, we may conclude that the dynamic structure of the model is representative of the actual economy and the model may be useful as a forecasting tool. Table 9 provides the serial correlation test for the estimated model, indicating that the VAR (4) is free of serial correlation since all the probability values are high.

Table (6): Lag Order Selection Criteria on the Length of Lags.

Lag	FPE [1]	AIC [2]	SC [3]
0	0.02961	7.83	7.98
1	0.00010	2.13	2.88
2	0.00010	2.12	3.46
3	0.00003	1.05	2.98
4	0.00001*	-0.87*	1.66*
5	0.00001	-0.76	2.36

[1]FPE denotes final prediction error.
[2]AIC denotes Akaike Information Criterion (1974).
[3] SC denotes Schwartz Information Criterion (1978).
*Indicates lag order selected by the criterion.

Table (7): Vector Error Correction Estimates, 1996:Q4-2011:Q1

Eq:	CointEq1			
D(GDP(-1))	1.000000			
D(CPI(-1))	-0.267878	(0.38801)	[-0.69039]	
D(DF(-1))	-0.019662	(0.00369)	[-5.33459]	
D(IR(-1))	-0.043995	(0.00588)	[-7.47934]	
C	-0.017633			
Error Correction:	D(GDP,2)	D(CPI,2)	D(DF,2)	D(IR,2)
CointEq1	-0.251916	0.055721	55.18724	33.43886
	(0.10262)	(0.08863)	(43.6441)	(7.79916)
Cointegrating	[-2.45492]	[0.62867]	[1.26448]	[4.28749]
D(GDP(-1),2)	-0.976109	0.037468	-38.54380	-1.297731
	(0.17055) [-5.72320]	(0.14731) [0.25435]	(72.5380) [-0.53136]	(12.9625) [-0.10011]
D(GDP(-2),2)	-1.053522	0.078271	-40.71082	6.701956
	(0.16257) [-6.48047]	(0.14041) [0.55743]	(69.1423) [-0.58880]	(12.3557) [0.54242]
D(GDP(-3),2)	-1.103228	0.075045	-3.788576	16.57567
	(0.15867) [-6.95304]	(0.13705) [0.54759]	(67.4835) [-0.05614]	(12.0592) [1.37452]
D(GDP(-4),2)	-0.229794	0.048359	-15.89590	26.44652
	(0.15892) [-1.44598]	(0.13726) [0.35231]	(67.5902) [-0.23518]	(12.0783) [2.18959]
D(CPI(-1),2)	0.430307	-0.252827	179.1896	0.537082
	(0.20791) [2.06968]	(0.17958) [-1.40791]	(88.4264) [2.02643]	(15.8017) [0.03399]
D(CPI(-2),2)	-0.038077	-0.324002	241.9181	-19.19699
	(0.22698) [-0.16775]	(0.19605) [-1.65265]	(96.5383) [2.50593]	(17.2513) [-1.11278]
D(CPI(-3),2)	-0.051597	-0.333157	-20.96092	17.56411
	(0.18454) [-0.27960]	(0.15939) [-2.09021]	(78.4859) [-0.26707]	(14.0254) [1.25231]

Table (7): Vector Error Correction Estimates, 1996:Q4-2011:Q1				
D(CPI(-4),2)	0.197738	-0.178972	142.4501	-2.276949
	(0.18868) [1.04799]	(0.16297) [-1.09819]	(80.2489) [1.77510]	(14.3404) [-0.15878]
D(DF(-1),2)	-0.003701	0.000693	-0.701152	0.581591
	(0.00184) [-2.00750]	(0.00159) [0.43520]	(0.78404) [-0.89428]	(0.14011) [4.15103]
D(DF(-2),2)	-0.002327	0.000498	-1.031205	0.428690
	(0.00140) [-1.65872]	(0.00121) [0.41125]	(0.59670) [-1.72818]	(0.10663) [4.02037]
D(DF(-3),2)	-0.001363	-7.75E-05	-1.104486	0.258605
	(0.00092) [-1.48774]	(0.00079) [-0.09804]	(0.38952) [-2.83553]	(0.06961) [3.71526]
D(DF(-4),2)	-0.000278	-0.000167	-0.622030	0.107865
	(0.00046) [-0.60666]	(0.00040) [-0.42258]	(0.19461) [-3.19626]	(0.03478) [3.10161]
D(IR(-1),2)	-0.006786	0.003865	2.606358	0.552922
	(0.00393) [-1.72845]	(0.00339) [1.13976]	(1.66979) [1.56089]	(0.29839) [1.85301]
D(IR(-2),2)	-0.006677	0.000313	2.142775	0.416560
	(0.00338) [-1.97606]	(0.00292) [0.10713]	(1.43708) [1.49106]	(0.25681) [1.62208]
D(IR(-3),2)	-0.005853	-0.001128	1.101289	0.448107
	(0.00241) [-2.43231]	(0.00208) [-0.54269]	(1.02353) [1.07597]	(0.18290) [2.44996]
D(IR(-4),2)	-0.003193	-0.001616	1.598777	0.325653
	(0.00143) [-2.23730]	(0.00123) [-1.31151]	(0.60692) [2.63425]	(0.10846) [3.00263]
C	-3.57E-06	-0.000126	-0.081439	-0.033326
	(0.00251) [-0.00142]	(0.00217) [-0.05829]	(1.06857) [-0.07621]	(0.19095) [-0.17452]
R-squared	0.980260	0.476975	0.927710	0.715165
Adj. R-squared	0.970390	0.215462	0.891564	0.572747
Sum sq. resids	0.011011	0.008215	1991.818	63.60557
S.E. equation	0.017996	0.015544	7.653946	1.367754
F-statistic	99.31804	1.823908	25.66619	5.021605
Log likelihood	146.1773	153.7955	-168.5694	-79.02269
Akaike AIC	-4.929898	-5.222904	7.175744	3.731642
Schwarz SC	-4.254468	-4.547474	7.851175	4.407073
Mean dependent	-0.000221	-1.21E-05	0.174893	-0.030385
S.D. dependent	0.104583	0.017549	23.24339	2.092501

[1]The definitions of the variables are reported in Table 1. The Δ denotes the changes in the variables, numbers in [ ] are t-statistics.
[2] Log-L, AIC, and SIC are, respectively, the Log-likelihood value, the Akaike Information Criterion (1974), and Schwartz information Criterion (1978).

Figure (3): Plot of the Estimated Residuals

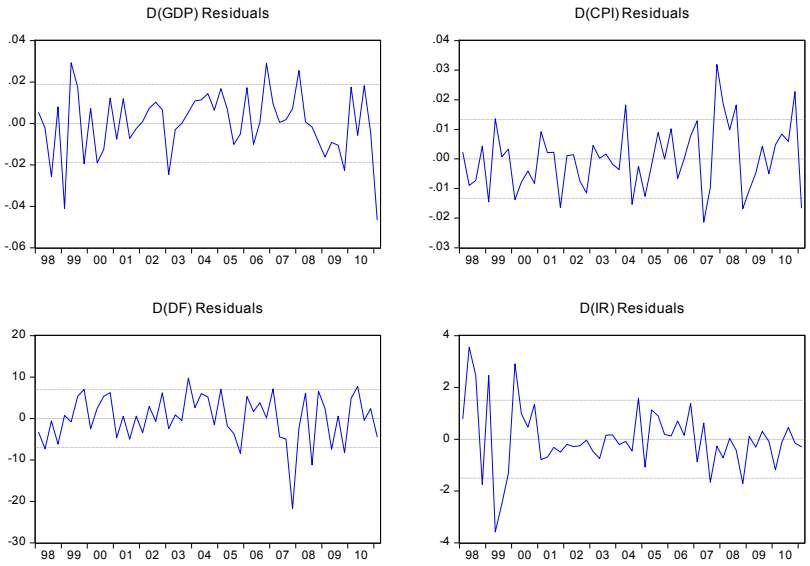


Table (8): Root and Modulus of the Characteristic Polynomial Endogenous Variables.	
Root	Modulus
0.000200 - 0.996942i	0.996942
0.000200 + 0.996942i	0.996942
0.983936	0.983936
-0.976284	0.976284
0.857853 - 0.045508i	0.85906
0.857853 + 0.045508i	0.85906
0.033050 - 0.821000i	0.821665
0.033050 + 0.821000i	0.821665
0.512454 - 0.616251i	0.801483
0.512454 + 0.616251i	0.801483
-0.547615 - 0.077251i	0.553037
-0.547615 + 0.077251i	0.553037

The GIRFs trace the intertemporal consequence of a positive one standard deviation shock to one of the disturbances contained in the ε_t vector. Since the shock is positive it represents a contractionary monetary policy in the interest rate equation and represents an expansionary fiscal policy in the deficit equation. Therefore, plotting the GIRFs provides information about how both interbank rate and government deficit respond over time to each other and to real output growth and inflation. Also, it provides information on how output growth and inflation respond to interbank rate and fiscal deficit shocks.

Impulse Response Functions for the interaction between monetary and fiscal policy

The dynamic effects of contractionary monetary policy in the form of higher interbank rate are reported in Figure 4. The deficit responds positively to the interest rate shock at the initial period and becomes less significant for the rest of the period indicating a short-run positive impact of contractionary monetary policy on the deficit. Generally, the interest rate - deficit links are organized in the literature under several effects. The expenditure effect says that higher interest rates may cause the level of output to be lower than expected. This may lead the government to increase output by expanding expenditures which leads to higher budget deficit. The revenue effect says that in the short run, higher interest rate may lead to slower output growth. If so, tax revenues might be reduced, thus leading to a rise in the government budget deficit. Another important effect is that the increase in the deficit will be financed by local and global borrowing. Consequently, the more the need for financing, the higher the burden on the budget in terms of higher debt services. Our results support the idea that monetary policy has a short run impact on the fiscal policy.

Figure (4): Impulse Response Functions to a Shock in IR

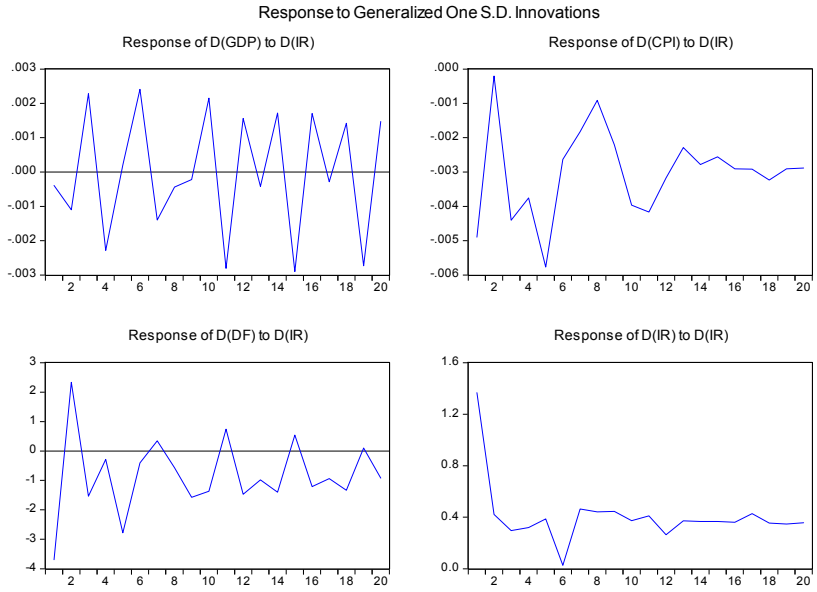
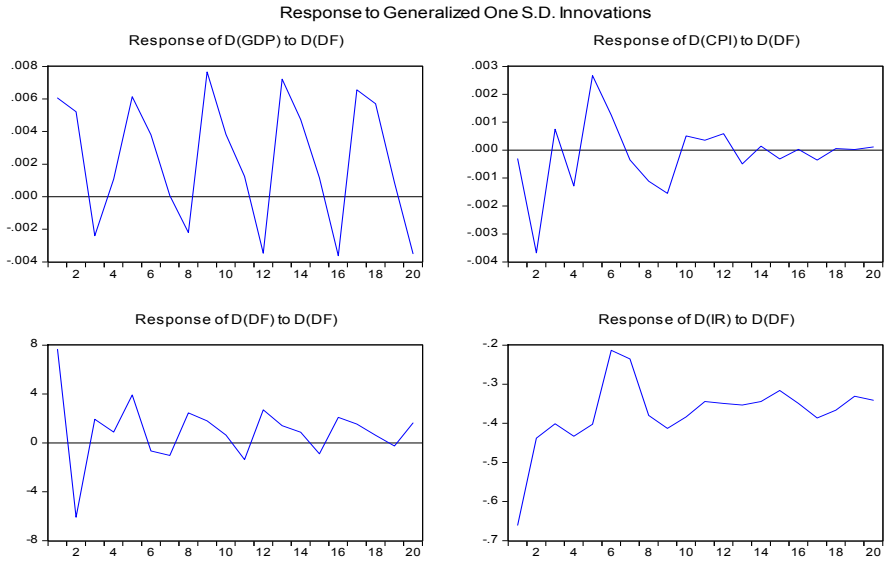


Figure (5): Impulse Response to a Shock in the Budget Deficit



The dynamic effects of expansionary fiscal policy in the form of higher deficit are reported in Figure 5. Initially, deficit expansion caused an increase in the interest rate, which maintained to approach its peak in the 6th quarter. In fact, the continuous demand for funds to finance the chronic deficit in the government budget causes the interest to increase over time. This result is consistent with the crowding out effect argument. Our results authenticate the

perception that monetary policy and fiscal policy are relatively dependent since a significant response is also estimated in interest rate to a deficit expansion.

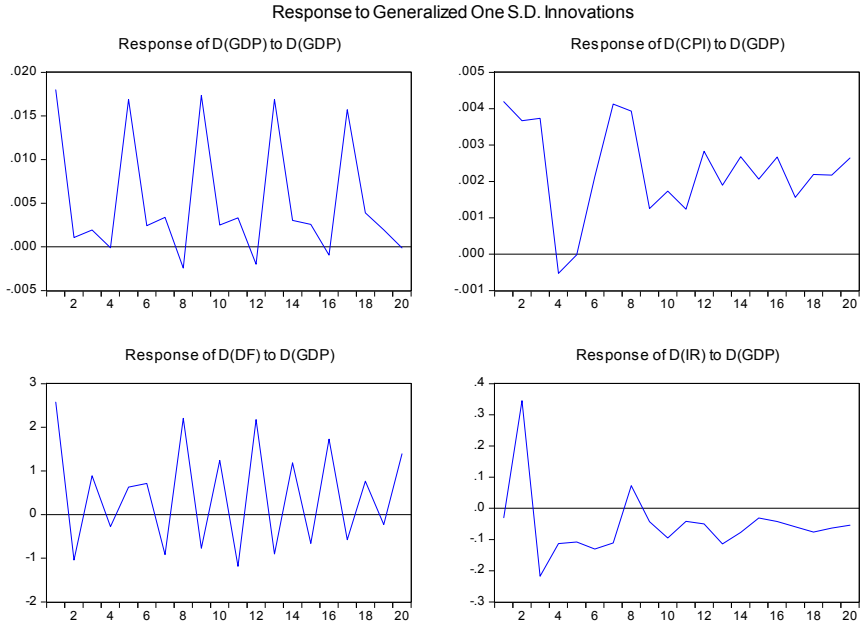
Impulse Response Functions of monetary policy and fiscal policy to the state of the economy

Output

The response of output to a positive shock in the interest rate and a deficit is always insignificant indicating no real impact of either monetary or fiscal policy on output (Figure 4 and 5). That is, output growth shows no response to monetary contraction or deficit expansion. Essentially, the fundamentals of output growth in Jordan are exports, FDI, worker remittances, tourism income and grants. All of them actually are determined by regional and global factors and they are not linked directly to domestic interest rate or deficit.

On the other hand, the dynamic responses of monetary policy and fiscal policy to output growth are reported in Figure 6. A positive shock in the growth rate of output initially causes an increase in the interest rate. This result is consistent with the IS/LM model. Businesses and households have a stronger demand for funds when output growth is higher; hence, interest rate may be higher. After the second quarter, interest rate decreases gradually to its pre-shock level.

Figure (6): Impulse Response Functions to a Shock in Output



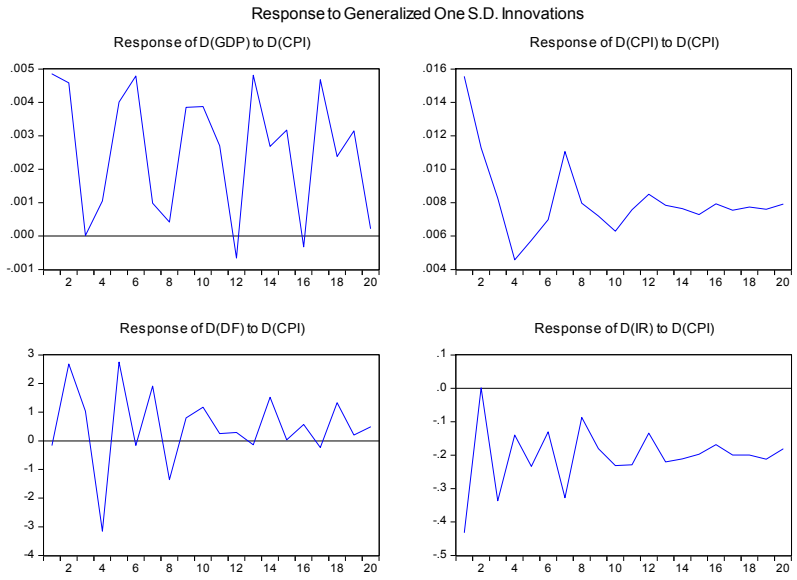
As for the deficit response, the deficit declines at the initial period and becomes insignificant for the rest of the period. Indeed, output growth increases revenues and declines the demand for expenditures required to finance social safety nets which in turn causes the deficit to decline. However, in the long run, deficit decisions in Jordan may depend on the developments and/or the interaction of revenue and expenditures which constitute another interesting area of research that may contribute to the revenue- expenditure or expenditure - revenue debate. Furthermore, the Jordanian chronicle structural deficit entails that deficit decisions are taken in isolation from output developments.

Inflation

As depicted in Figure 4, in the first three quarters, monetary contraction failed to produce any decline in inflation. This is the price puzzle: an increase in inflation in the short-run after a contractionary monetary shock. Similar results are found in Sims (1992) and Eichenbaum and Evans (1994) for the United States. Dale and Haldane (1994) found similar results for the United Kingdom. In our research, however, the price puzzle is short lived and is absent after three quarters. After three quarters, as one might expect, inflation falls gradually, supporting the idea of sticky prices. Increases in the interest rate lessen aggregate demand. As a result, inflationary pressures are expected to be lower over time.

According to the dynamic effects of expansionary fiscal policy inflation shows a significant response to deficit expansion only after two quarters (Figure 5) a result consistent with lag effect literature of the growing budget deficit.

Figure (7): Impulse Response Functions to a Shock in Inflation



Alternatively, the dynamic response of monetary policy and fiscal policy to inflation shocks is reported in Figure 7. Concerning the interbank rate response, a positive shock in inflation leads to an increase in nominal interest rate. This represents the central bank reaction function to fight inflation by higher interest rate. The peak response is about the second quarter then it declines gradually. As for the deficit response, a positive shock in inflation leads initially to an increase in deficit and turns out to be insignificant for rest of the period.

Table (9): Residual serial correlation LM tests

Lags	LM-Stat [1]	Prob [2]
1	22.30	0.13
2	21.62	0.16
3	16.41	0.42
4	22.40	0.13
5	14.74	0.54
6	12.71	0.69
7	10.61	0.83
8	14.45	0.57
9	16.44	0.42
10	6.29	0.98
11	14.58	0.56
12	16.98	0.39

[1] LM test: denotes the serial correlation LM test of Breusch-Godfrey.

[2] All probability values support the null hypothesis of no serial correlation.

Robustness of the Empirical Results

It is worth concluding this paper by stressing the robustness of our empirical results. As these results were obtained by employing a data set spanning the period 1996:4-2011:1, a criticism can be made that our empirical work does not account for possible structural or policy - regime change. However, it appears that the conclusions discussed above are robust to this criticism since the results measured over a shorter period, 2000:1- 2002:1, did not change the results in any notable way. In fact, they are qualitatively the same. This would suggest that shifts in policy regimes raise no serious difficulties for our analysis. On the other hand, since the VAR are very sensitive to the lag length selection, we imposed shorter lags as suggested by Schwartz Information Criterion (SIC) the results again yielded similar conclusions. Moreover, to face debate over the choice of vector error correction model (VECM) compared to the VAR model in case the variables are cointegrated, both models were employed and there were no significant differences related to our analysis.

CONCLUSION

This study has examined the dynamic interaction between monetary and fiscal policy in Jordan. By employing the VECM, this research measured how and to what extent both monetary and fiscal policies are responding to each other and to the movements in output growth and inflation.

The findings authenticate the perception that monetary policy and fiscal policy are relatively dependent. In contrast, output growth shows no response to monetary contraction or deficit expansion. On the other hand, a positive shock in the growth rate of output causes an increase in the interest rate. As for the deficit response to a positive shock in the growth rate of output, the deficit declines substantially at the initial period and becomes insignificant for the rest of the period.

As for inflation, in the first three quarters monetary contraction failed to produce any decline in inflation. After three quarters, as one might expect, inflation falls gradually, supporting the idea of sticky price. According to the dynamic effects of expansionary fiscal policy, inflation shows a significant response to deficit expansion only after two quarters.

Alternatively, a positive shock in inflation leads to an increase in nominal interest rate. This represents the central bank reaction function to fight inflation by higher interest rate. As for the deficit response, a positive shock to inflation leads initially to an increase in deficit and turns out to be insignificant for rest of the period.

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WHAT SHOULD WE TEACH OUR STUDENTS ABOUT INTEREST RATES DETERMINATION

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ABSTRACT

Introductory macroeconomics textbooks determine interest rates either by liquidity-preference, or loanable-funds approaches, or both. Instructors face problems explaining the effects of fiscal policy when only liquidity-preference approach is introduced, whereas impacts of monetary policy are difficult to explain if only loanable-funds approach is used for interest rates determination. Some authors introduce both the approaches at two different places and use them for different purposes. Students wonder why they need to use two models to explain one concept. Other authors struggle to reconcile, but fail to show how the two approaches lead to the same interest rate. By redefining the concept of the supply of loanable-funds in the light of excess reserves, we present our model of interest rates determination that is capable of tracing the impact of both monetary and fiscal policies on short- and long-run nominal and real interest rates together with the dynamics of it adjustments. Our model is also capable of explaining the effects of changes in required reserve ratio or discount rate on the interest rates. We believe that our model will greatly help the students to understand the concept of interest rates determination better.

JEL Classification Codes:
A22 - Economic Education and Teaching of Economics (Undergraduate)
E43 - Macroeconomics & Monetary Economics (Interest Rates: Determination, Term Structure, and Effects)

INTRODUCTION

In the standard macroeconomics principles textbooks, some authors present only the liquidity-preference (LP) approach, others present only the loanable-funds (LF) approach, and the rest present both the approaches to the modeling of interest rates (r). The LP approach determines the nominal r in the money market where the equilibrium nominal r is the rate that equates quantity of nominal money supplied (M) by the central bank with quantity of nominal money demanded by the public. Among the textbooks we examined, Baumol and Blinder (1999), Boyes and Melvin (2011), McEachern (1997), O'Sullivan, Sheffrin and Perez (2010), and Schiller (2010) belong to this group, who use only the LP approach to determine equilibrium

r. The LF approach, on the other hand, determines the real r in the LF market where the equilibrium real r is the rate that equates the quantity supplied of LF, which consists of private saving (S), with the quantity demanded for LF, which consists of investment (I) and bond financed government deficit (G – T). Instead of viewing budget deficit (G - T) as a part of the demand for LF, some authors prefer to view it as negative amount of government saving, and incorporate that in the supply of LF. Needless to say, the conclusions drawn from these two different representations are identical. Cowen and Tabarrok (2010) are the authors who use only the LF approach for equilibrium r determination. The rest of the authors we examined use both the approaches to explain equilibrium r; however, the presentation of the two approaches differs significantly among these authors. Bade and Parkin (2011), Frank and Bernanke (2009), Hall and Lieberman (2005), Hubbard and O'Brien (2010), Mankiw (2007), Miller (2011), and Sexton (2002) keep the two approaches completely separate. They use the LP approach to determine the short-run nominal r, and the LF approach to determine the long-run real r without showing any relationship between them. Colander (2010), Gwartney, Stroup, Sobel, and Macpherson (2009), Krugman and Wells (2009) and Parkin (2010), on the other hand, put the LF and the LP diagrams side-by-side in order to reconcile the two approaches. Since often there is a close connection between movement in the short-run nominal r and the long-run real r, these authors assume zero inflation expectation to make the real r the same as the nominal r. Since the choice of approach to explain equilibrium real and nominal r in the short- and in the long-run differs significantly among authors, we classify these leading authors into four different groups according to their choice of approach:

1. Authors using only the LP approach
2. Authors using only the LF approach
3. Authors using both the approaches but keep the purpose of the two approaches separate.
4. Authors using both the approaches and try to reconcile them to explain equilibrium r both in the short- and in the long-run.

In this paper, we will discuss the problems and shortcomings of each of these groups' coverage of this topic and suggest remedies for these inadequacies.

AUTHORS USING THE LP APPROACH ONLY

The advantage of applying one approach over two is that it is definitely less confusing to the students. All the authors in this category argue that an open market purchase shifts the supply of money curve to the right that leads to a lower r; however, this r is the rate when both income (Y) and prices (P) are held constant. This is the money market clearing r which we will call the "immediate-run" equilibrium, a level that is reached before the short-run equilibrium

when Y adjusts while P is held constant. The short-run r will be higher than the immediate-run r, as an increase in Y will shift the demand for money curve up.

One of the down sides of using only LP approach is that it cannot effectively explain how a change in the government budget deficit affects r. While trying to explain the concept of crowding-out, Boyes and Melvin (2011, p.247) and Schiller (2010, p.255) state that an increase in government borrowing drives up r; but do not explain how that happens in terms of the LP diagram. Other than O'Sullivan, Sheffrin and Perez (2010), none of the authors in this group attempts to determine the long-run r. O'Sullivan, Sheffrin and Perez (2010) however use the LP diagram (p.339), and explain that an increase in the government budget deficit will increase wages and prices, and hence demand for money in the long-run raising r.

McEachern (1997) explains in words only (p. 329), whereas Baumol and Blinder (1999) are the only authors in this group who explain in terms of the LP diagram (p.309), the short-run adjustment of r after conducting an expansionary fiscal policy. They argue that an increase in government purchases increases aggregate demand that leads to greater Y, which in turn increases money demand. For a given supply of money (M), an increase in money demand leads to a higher r. The problem with this argument is that an increase in the budget deficit affects r only indirectly through an increase in Y. That gives rise to a few issues:

1. In the LP model, increase in the budget-deficit has no immediate-run impact on r. If that be the case, how can the Fed sell bonds in the first place at the same r?
2. Interest rate according to the LP model does not change in the short-run when expansionary fiscal policy has no net effect on aggregate demand and hence Y, i.e. when crowding-out is complete.

AUTHORS USING THE LF APPROACH ONLY

Using the LF approach alone makes it difficult to explain the effects of monetary policy on r. Cowen and Tabarrok (2010) are the authors who use only the LF approach to explain equilibrium r. According to them, the quantity supplied of LF consists of private saving, and four major factors determining saving are: smoothing consumption, impatience, marketing and psychological factors, and r. The demand for LF, on the other hand, consists of investment and bond financed government budget deficit. They use the LF diagram to explain how an increase in government borrowing crowds out private consumption and investment by increasing r (p. 160). However, six chapters later, when time comes to explain the effects of an open market purchase on r, they couldn't use the LF model. Instead, they use a third model (that may be referred to as the "bond market model") where the price of bonds, which is inversely related to r, is determined by the demand and the supply of bonds:

> *"When the Fed buys bonds, it increases the demand for bonds, thus lowering the interest rate. So buying bonds stimulates the economy through two distinct mechanisms, namely higher money supply and lower interest rates."*(P. 296)

Cowen and Tabarrok (2010) mention that the Fed controls real r only in the short-run and not in the long-run (p. 297). They argue that expansionary monetary policy lowers r through increased price of bonds in the bond market and not by the LF model. A few points need to be noted:

- The authors in fact use two models to explain the movements of r. The effects of fiscal policy are analyzed through the LF model while the short-run effects of monetary policy are explained through the bond market model.
- The question remains as how the change in r in the bond market affects r in the LF market.
- How to explain with the help of the LF diagram, what happens to r when the Fed reduces the required reserve ratio or discount rate.
- Neutrality of money implies that the real r will increase in the long-run to its original level after an expansionary monetary policy. The dynamics of adjustment is completely absent in their analysis.

AUTHORS USING BOTH THE APPROACHES BUT FOR DIFFERENT PURPOSES

These authors place the two approaches of r determination far apart in two separate chapters in the text. The LF approach is usually explained early in the textbook in the 'Saving and Investment' chapter, whereas the LP approach is presented much later in the 'Monetary Policy' chapter. Their idea is that long-run real r is determined in the LF market whereas short-run nominal r is determined in the money market. The two approaches are viewed as independent of one another and are used to determine two different interest rates. Mankiw (2007) is very clear about this:

> *"The different theories of interest rate are useful for different purposes. When thinking about long-run determinants of interest rate, it is best to keep in mind the loanable-funds theory. ---- By contrast, when thinking about the short-run determinant of the interest rates, it is best to keep in mind the liquidity-preference theory."* (p. 478)

Having no connection between the two approaches, the dynamics of adjustment from short- to long-run equilibrium is missing in their analyses. With the help of the LP diagram and the short-run aggregate expenditure diagram, Hall and Lieberman (2005) demonstrate how an increase in

government purchase affects the short-run r. What is missing from their analysis is the determination of the long-run r.

The idea of two approaches to determine r is one of the major sources of confusion among students. While discussing the LF market, these authors explain the effects of an increase in the government budget deficit and avoid discussing the effects of an increase in the money supply on r. This can be explained by pointing out that the LF diagram depicts a long-run model and an increase in the government budget deficit increases r while increase in the money supply has no effect on r in the long-run. However, this argument bypasses the questions: how expansionary monetary policy affects r in the short-run, and how the long-run equilibrium is reached from the short-run equilibrium. Similarly, in the money market, these authors explain only the effects of an increase in the money supply on r in the immediate-run. Thus, their approach to r determination fails to show the effects of an increase in the government budget deficit on r in the short-run. Bade and Parkin (2011) talk about long-run value of money determination and never mention its relation with long-run r.

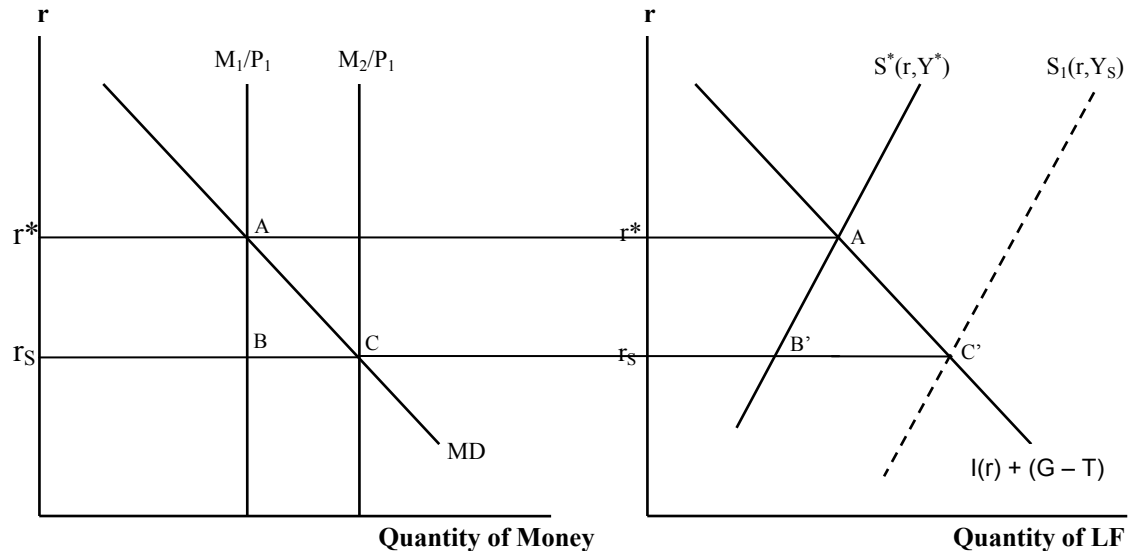
AUTHORS TRYING TO RECONCILE TWO APPROACHES

Colander (2010), Gwartney, Stroup, Sobel, and Macpherson (2009), Krugman and Wells (2009) and Parkin (2010) try to reconcile the two approaches by presenting side-by-side graphs of the money and the LF markets. They depict the money market on the left side in panel (a), and the LF market on the right side in panel (b). We reproduce their graphs in **Figure 1**.

To illustrate the effect of an increase in the money supply resulting from an open market purchase, they start from an initial long-run equilibrium at point A in panels (a) and (b). They argue that an open market purchase simultaneously shifts the money supply curve and the supply of LF (S_{LF}) curve to the right. The S_{LF} curve shifts because an increase in money supply will increase Y due to lower r in the money market causing an increase in S in the LF market at each r. This is shown in **Figure 1** where the short-run decline in r is the same in each market (i.e., r* to r_S in **Figure 1**). While their effort to reconcile the two approaches is commendable, they fail to explain two things:

1. Why and how the two markets equilibrate at the same r after the economy is out of initial equilibrium. In their approach, they implicitly insist on an invalid constraint that an increase in the money supply will shift both the money supply and the S_{LF} curves in such a way that both the markets will lead to a unique r in the short-run. In other words, they fail to show why the S_{LF} curve shifts exactly by the amount of B'C' due to an increase in money supply of BC in the money market, no more no less.
2. If an increase in Y shifts the S_{LF} curve to the right, why it failed to shift the demand for money curve up in their models?

Figure 1: Interest Rate Adjustments after an Increase in Money Supply
(According to GSS&M, and Krugman & Wells)



(a) Money Balances **(b) Loanable Funds**

Note that the first point can easily be explained by arbitrage opportunities which will ensure that the r will be the same. The second point can be explained by considering the net effect - the demand for money curve will shift up as the S_{LF} shifts left from S_1 (Fig 1), but doesn't shift as far as S_1 in the first place. The resulting r is somewhere between r* and r_s. Although both the points can be explained very easily, none of the textbooks we looked at actually explained it. We understand that the existing approach keeps the matter simple, but it is at the expense of confusion on the part of the students.

OUR APPROACH TO INTEREST RATES DETERMINATION

We believe that students will be better served if we use only one model for r determination. Our objective is to determine real and nominal r in the immediate-, short- and in the long-run by a single model. We also want to explain how r reaches from one long-run to another long-run equilibrium via immediate- and short-run adjustments after an initial disturbance in the economy. To that end, we need to look in to the concept of the S_{LF} more in depth.

Given Y, households decide on its distribution between consumption (C) and saving (S) at different r. In the traditional sense, S constitutes the S_{LF} as households decide on how much of S will be in the form of direct lending (DL) such as buying bonds and how much will be in the form of indirect lending (IL), i.e. deposits in banks. Mankiw (2007) puts it eloquently:

> *"The supply of loanable funds comes from people who have some extra income they want to save and lend out. This lending can occur directly, such as when a household buys a bond from a firm, or it can occur indirectly, such as when a household makes a deposit in a bank, which in turn uses the fund to make loans."* (p. 280).

$$\text{So, } S = DL + IL.$$

However, IL, which constitutes households' deposits in banks, becomes the total reserves (TR) from which the banks make loans. Note that the entire TR cannot be loaned out and hence cannot be included in the S_{LF} as banks have to keep, by law, a part of their TR as required reserves (RR). The part of IL that is available to a bank for loan purposes is actually the rest of the reserves, known as excess reserves (ER = TR – RR). We know that one bank can create money by giving loans up to the amount of its excess reserves. However, the whole banking system can give loans up to its excess reserves times simple deposit multiplier, which is 1/required reserve ratio; i.e. ER/RRR where RRR is the required reserve ratio. Hence, the total supply of loanable funds available from the whole banking system out of the total household deposits of IL (TR) is ER/RRR. To sum up, households distribute their given Y into C and S where only a part of S constitutes the S_{LF}:

$$S_{LF} = DL + (TR - RR)/RRR = DL + ER/RRR$$

(Note that if banks choose to hold an additional amount of reserves (AR) on the basis of their daily business requirements, the desired reserves (DR) will be equal to RR + AR. At that time excess reserves (ER) = [TR – (RR + AR)] and the S_{LF} = DL + ER/DRR, where DRR is the desired reserve ratio). In the LF diagram, the quantity supplied of LF changes (movement along the S_{LF} curve) when r changes ceteris paribus, whereas there will be a shift of the S_{LF} curve when any non-interest determinant of the S_{LF} changes. An increase in TR will increase ER shifting the S_{LF} curve to the right, whereas any increase in RRR will reduce ER shifting the S_{LF} curve to the left. A transfer of funds from DL to TR (i.e. households selling bonds and deposit the money in banks) will increase the S_{LF} for every r shifting the curve to the right. It is important to note that the above statement is true when RRR < .5. A $1 transfer from DL to IL reduces DL by $1 but increases IL by (1-RRR)/RRR so that the S_{LF} increases by (1-RRR)/RRR – 1. When RRR = .5, increase in the S_{LF} is zero in that case and negative when RRR > .5. Since historically RRR is much less than .5 we stick to the fact that open market purchase by the Fed (household selling bonds) shifts the S_{LF} curve to the right. Note that this result is significantly different from the traditional conclusion that the S_{LF} is unaffected when the composition of S (between DL and IL) changes for a given S.

The demand for LF remains exactly the same; i.e. it is the sum of investment demand (I) and bond financed government budget deficit (G - T). Together with the newly defined S_{LF}

mentioned above, we propose a comprehensive analysis of the real and nominal r in the immediate-, short-, and in the long-run noting the following characteristics of Y and P in the immediate-, short-, and in the long-run already established and accepted in the discipline:

1. Y is constant at potential level of output (Y*) in the long-run. It is constant in the immediate-run, but variable in the short-run. Y increases when aggregate demand is higher than aggregate supply and vice versa.
2. P is constant in the immediate- and in the short-run. In the long-run, P will rise when short-run Y is higher than Y* and vice versa.

Following the standard practice, we measure the real r on the vertical axis and the quantity of LF in the horizontal axis to draw the demand and the S_{LF} curves. We start with the long-run equilibrium r with zero percent inflationary expectation. We then introduce a monetary/fiscal policy shock and trace the movement of the real r back to its long-run level via immediate- and short-run equilibrium. As long as inflation expectation doesn't change, the real and the nominal r will be the same. If inflation expectation changes in the process, the nominal r will be higher than the real r by the amount of the expected inflation. The nominal r at that time can be derived by adding the expected inflation rate to the real r.

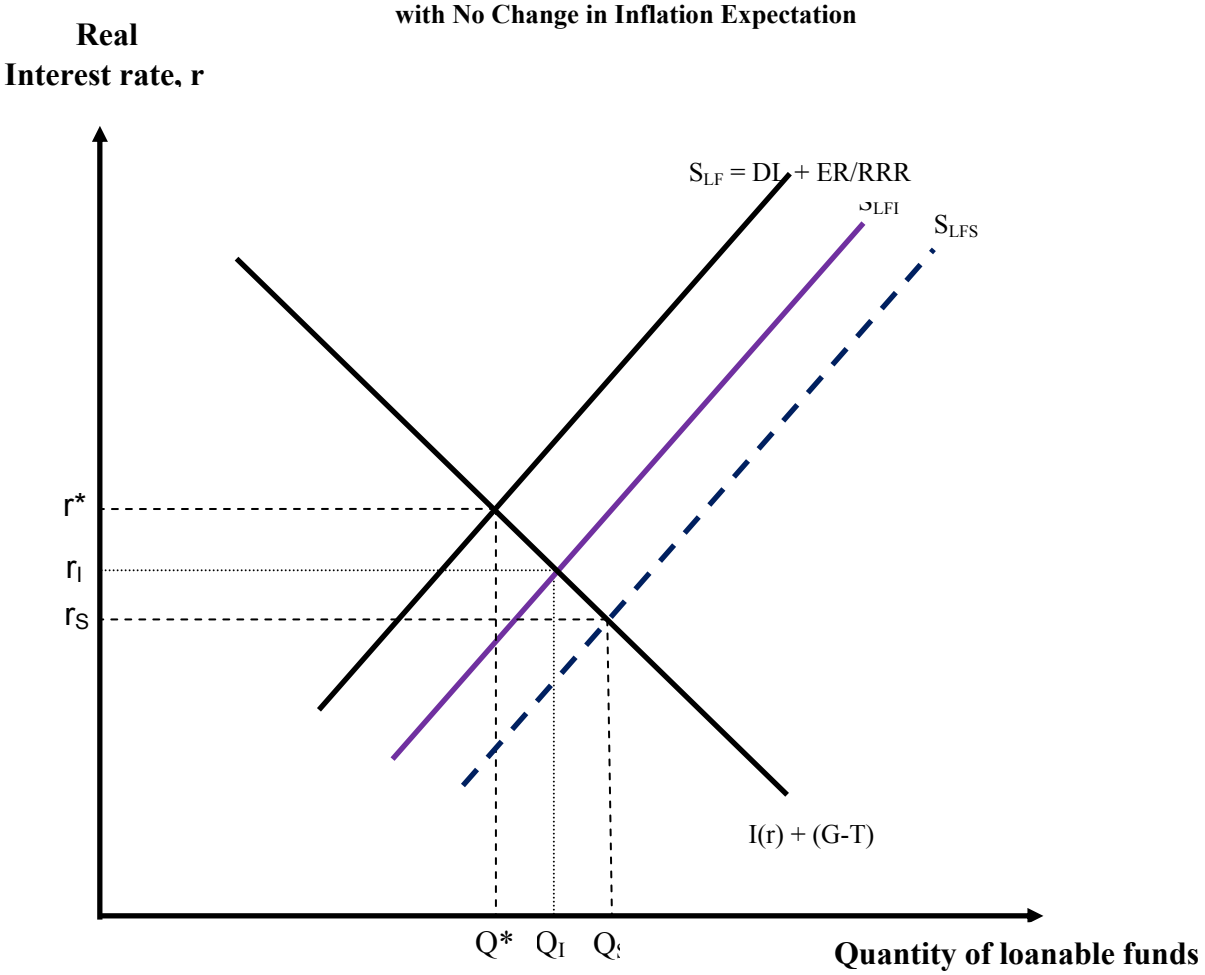
THE EFFECTS OF AN INCREASE IN MONEY SUPPLY IN OUR MODEL

In **Figure 2**, we analyze the effects of an open market purchase on r with no change in inflation expectation.

Initially we start with a long-run equilibrium r (r*) position where the quantity of LF demanded, [I(r*) + (G – T)], equals the quantity of LF supplied at Y*. Given Y* and r*, saving S* (at Y* and r*) is also given with its distribution between DL* and IL* (TR*) where DL* is the desired bond holdings of the households in the long-run. As pointed out earlier, the S_{LF} available for loan at r* is DL* + (TR* - RR)/RRR. Note that in the traditional model, when the households sell bonds to the Fed (open market purchase), DL decreases and TR increases by the same amount while Y and hence the S_{LF} curve remain the same. Interest rate changes only in the short-run when expansionary monetary policy increases Y and hence S. This result is problematic because Fed has to offer a higher price of bonds (lowering r) in order to lure households to sell bonds. That is, r has to be lower in the immediate-run in order for the Fed to get all the bonds it wants to buy. In our model, however, when the Fed buys bonds and writes a check in return, households now have more deposits in the banks and less in the form of bonds in the immediate-run. As TR increases by the same amount of the decrease in DL, it increases the S_{LF} at constant r, shifting the S_{LF} curve to the right. Note that open market purchase directly affects r in the immediate-run in our model rather than indirectly affecting it through the Y change. It creates a surplus in the LF market at r* pushing r down from r* to r_I. However, this is

not a short-run equilibrium position as Y hasn't adjusted yet. It is, in fact, the 'immediate-run' equilibrium position where both Y and P are constant. Short-run r, r_S is attained when Y increases beyond Y* due to expansionary monetary policy. Higher Y increases S and hence DL and TR, shifting the S_{LF} curve further to the right.

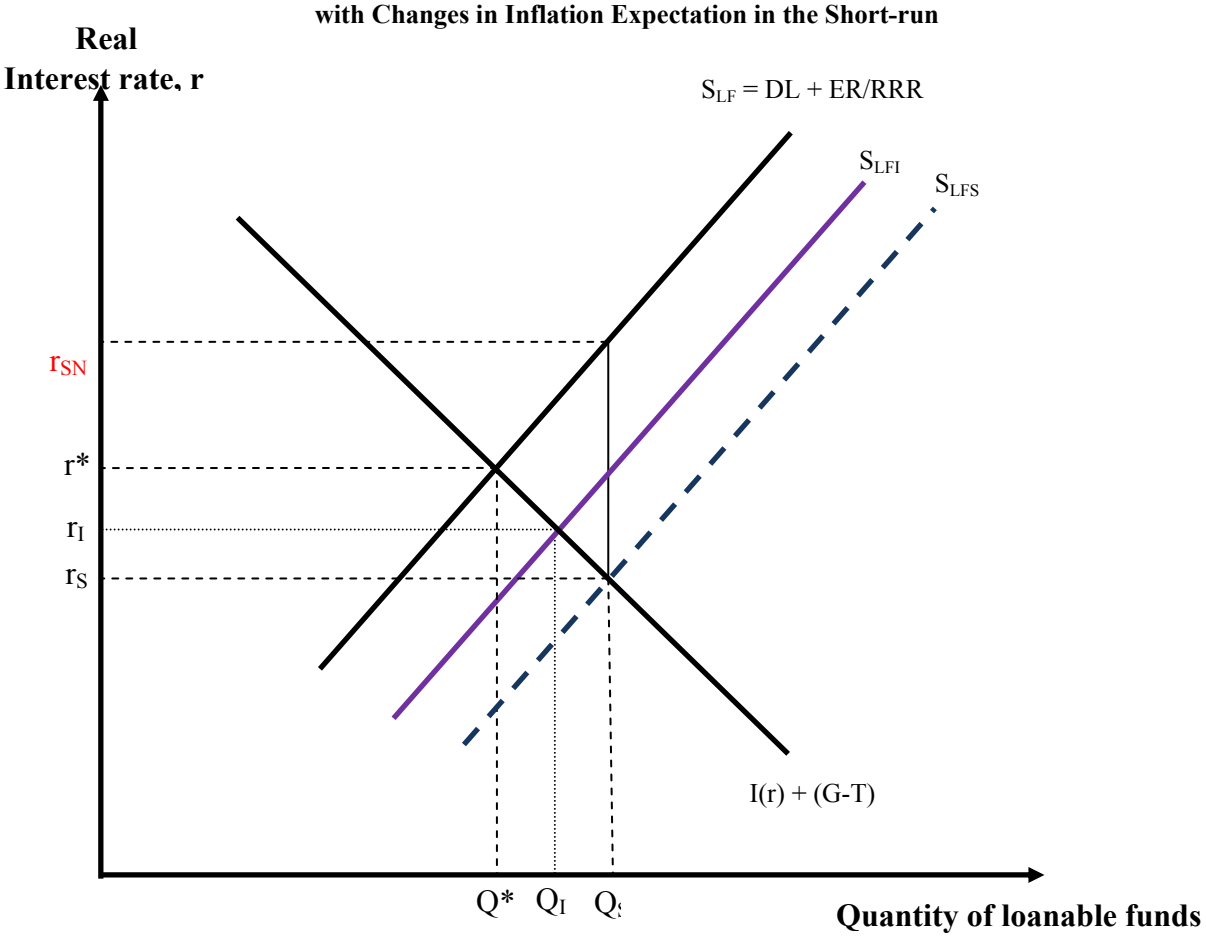
Figure 2: Effects of an Open Market Purchase with No Change in Inflation Expectation



In the absence of any change in inflation expectation, the nominal and the real r will remain the same in the short-run. In the long-run, equilibrium Y higher than Y* will push P up reducing Y back to its original level Y*. The S_{LF} curve moves back from S_{LFS} to $S_{LFI.}$ Expansionary monetary policy increases TR and reduces DL below the long-run desired DL*. When households buy bonds and reduce TR to reach their long-run desired saving portfolio, long-run equilibrium r will be restored at r* again; i.e. the neutrality of money is achieved when households adjust their long-run saving portfolio to DL*, its pre-monetary expansion level.

Macroeconomics principles textbooks assume constant inflation expectation to keep the subject matter simple. We don't recommend incorporating it in the principles of macro texts either; however, the strength of our model can be tested here by checking its robustness. If inflation is expected in the short-run, the nominal r will diverge from the real r by the amount of the inflation expectation. One case is depicted in **Figure 3** where inflation is expected by the amount of (r_{SN} - r_S). The short-run real r will remain at r_S, but the short-run nominal r will be r_{SN}, higher than r_S by (r_{SN} - r_S). Here, the market will see a rise in the nominal r with a lower real r in the short-run – a result which is known but was never modeled before. In the long-run, however, as P and saving portfolio adjust, the real and the nominal r will merge at r* and the inflation expectation will come down to zero percent again. The nominal r will decrease and the real r will increase to reach r* in the long-run. It shows that expansionary monetary policy has no long-run effect on r.

Figure 3: Effects of an Open Market Purchase with Changes in Inflation Expectation in the Short-run



THE EFFECTS OF A DECREASE IN THE RRR OR THE AR IN OUR MODEL

One of the most important contributions of our model is that it can also explain the effects of a change in the required reserve ratio (RRR) or discount rate on r, which the LF model cannot. If the Fed reduces RRR, required reserve will decrease for the same TR increasing ER for all r shifting the S_{LF} curve to the right. This will reduce r in the immediate-run. Again, if the discount rate is reduced, banks will be encouraged to borrow more money from the Fed increasing their TR and hence ER, shifting the S_{LF} curve to the right. In both of these cases, long-run r will be r_I and not r* due to lack of further saving portfolio adjustments in the long-run.

THE EFFECTS OF AN INCREASE IN THE BUDGET DEFICIT IN OUR MODEL

To analyze the effects of an increase in budget deficit on r, we again start with a long-run equilibrium r (r*) in **Figure 4** where the quantity of LF demanded, $[I(r^*) + (G - T)_0]$, equals the quantity of LF supplied. An increase in the budget deficit from $(G - T)_0$ to $(G - T)_1$ will shift the demand for LF curve to the right creating a shortage of LF at the old equilibrium r, r*. The new immediate-run r is r_I. Expansionary fiscal policy will increase Y in the short-run shifting the S_{LF} curve to the right depressing r to r_S. The increase in government borrowing is financed by $Q^* - Q_C$ of reduced investment (crowding out) and $Q_S - Q^*$ of reduced consumption.
The short-run equilibrium Y is higher than Y*. So P starts to rise in the long-run reducing Y to Y*. S decreases to its original level shifting the S_{LF} curve to the left to its starting point. It raises the long-run r to r*' which is the same as immediate-run r, r_I. The long-run crowding-out will be higher with higher r. An expansionary fiscal policy thus increases the short-run r and in the long-run it pushes it up further.

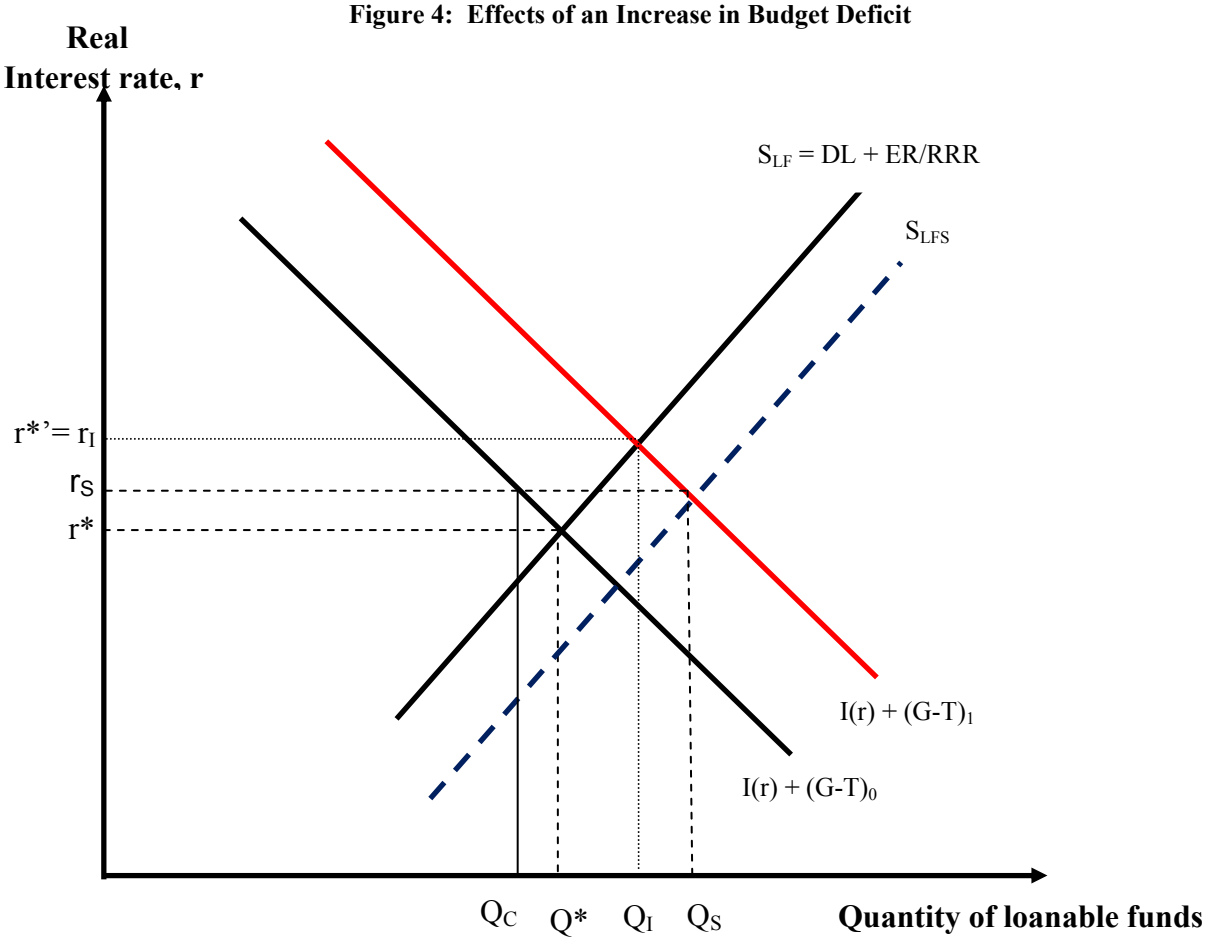
CONCLUSION

Currently, available principles of macroeconomics textbooks present either one or two different approaches to interest rate determination. The authors choosing only one approach made it easy for the students; but left lots of questions unanswered. When two approaches are presented, they are mainly in two different chapters with no relationship with one another. In the context of the LF model, the textbooks don't talk about the short-run monetary policy impact on r. The bonds market needs to be introduced to show the short-run impact. In the context of the LP model, the textbooks talk only about immediate-run and avoid short-run and long-run impact of fiscal policy. Students have to remember to use the LF model to find the long-run real r, the bonds market model to find the short-run real r, and the LP model to find immediate-run nominal r. Students wonder why two (actually three if one includes the bonds market) models are needed

to explain r. Authors trying to reconcile the two approaches again leave the students wondering how the two approaches lead to the same interest rate.

Students are introduced with the concept of excess reserves in the "Money and Banking" section of the text. By redefining the supply of loanable-funds in the light of excess reserves as the source of loanable funds, we present a model of interest rates determination that is capable of tracing the impact of both monetary and fiscal policies on immediate-, short- and long-run nominal and real interest rates together with the dynamics of it adjustments. Our model is also capable of explaining the effects of changes in required reserve ratio and discount rate on the interest rate. We believe that it will greatly help the students understand the concept of interest rates determination better.

Figure 4: Effects of an Increase in Budget Deficit



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IMPROVING TEACHING EFFECTIVENESS IN INTRODUCTORY ECONOMICS COURSES USING THE TEST OF UNDERSTANDING OF COLLEGE ECONOMICS (TUCE)

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ABSTRACT

This study extends the literature on using standardized tests to measure student learning in introductory economics courses by illustrating how the results of such tests can be used as a diagnostic and developmental tool by instructors to help them improve their teaching. The extent of student learning in each of the six content categories and three cognitive categories that are incorporated in the Test of Understanding in College Economics (TUCE), are used as a means of providing feedback to instructors that they can use to help them improve their teaching effectiveness. Results obtained in this way can be used in conjunction with student evaluations of courses and instructors.

Differences in the extent of student improvement in each of six content categories offers instructors information about subject areas in which more attention should be focused, or teaching practices altered, in the future. In terms of the three cognitive categories, results indicate that students gained most in terms of their knowledge of fundamental concepts but, as the level of abstract thinking increases, improvement in comprehension and application of economic concepts is much less, indicating that instructors may also want to consider changes in teaching strategies to better communicate information as well as to engage students in these topics as a means of improving their understanding. Overall, results obtained by using the TUCE in this manner can help instructors ascertain those subject and cognitive areas they need to focus on as a means of helping them improve their teaching effectiveness to further increase student learning.

INTRODUCTION

Measuring and evaluating teaching effectiveness is a complex and difficult task. Nevertheless, the information derived from such measurement and evaluations can be extremely valuable to individual instructors in terms of their further development as teachers.

The Test of Understanding in College Economics (TUCE) has been used extensively as a means of measuring student learning in introductory economics courses. This purpose of this paper is to illustrate how information derived from the TUCE in introductory economics courses

can also be used to provide feedback to instructors in these courses to help them improve their teaching effectiveness. The results obtained can be used to help instructors better understand a) what students are learning and how well they are achieving the learning goals for their courses; and b) specific areas of course content and cognitive categories for which students' performance is poor and/or lower than their overall performance.

Identification of content and cognitive categories for which students' improvement is low, or lower than their overall improvement, provides useful information that can be used by instructors to indicate those topics to which they should concentrate additional time and emphasis in teaching the course in the future. In addition, instructors may want to consider changes in teaching strategies in order to better communicate information and engage students as a means of improving their understanding and achievement of course learning goals. Results obtained in this way can be used in conjunction with student evaluations of courses and instructors in an ongoing process of improving teaching effectiveness.

LITERATURE REVIEW

The focus of this study on using outcomes achieved in introductory economics courses as a means of evaluating teaching and providing feedback to instructors is consistent with the following definition of effective teaching: "Effective teaching can be defined, very simply, as activities that promote student learning. It encompasses all of those instructor behaviors that foster learning of the instructor's and/or of the institution's educational objectives." (UCLA Office of Instructional Development, https://www.oid.ucla.edu/ publications/evalofinstruction/eval1#1, accessed on October 1, 2010)

Research on evaluating teaching effectiveness is extensive. While teaching effectiveness and student learning are closely related, historically the focus of this research primarily has been on discovering and describing teacher characteristics that are associated with good teaching. This approach emphasizes the process of teaching such as course organization, teaching behaviors (lecture, discussion, etc.), as well as student learning activities and evaluation procedures.

Summarizing the research on characteristics of good teachers, Eble, (1988, pp. 21-22) notes:

> Most studies stress knowledge and organization of subject matter, skills in instruction, and personal qualities and attributes useful to working with students.

Eisenberg (1996), cited in Seldin (1999, p.3) analyzed 18 studies concerned with effective teachers and reported the following characteristics of such teachers: knowledge, organization/clarity, stimulation/enthusiasm, use of active learning, effective communication, and instructional openness.

Specifically in terms of economics instructors, Boex (2000) used responses from student evaluations of instructor surveys to ascertain the attributes of economics instructors that are associated with teaching effectiveness as perceived by their students. Six broad instructor attributes were identified: presentation ability, organization and clarity, grading and assignments, intellectual or scholarly capacities, instructor-student interaction, and student motivation. Results of this analysis indicated that students perceive the dominant attributes of an effective economics instructor to be organizational skills and clarity. This finding is consistent with findings of other studies and indicates the far greater importance of this attribute as compared with other instructor attributes in determining instructor's effectiveness, as perceived by students.

More recently, research concerning evaluation of teaching effectiveness has moved away from a focus on teacher characteristics and toward increased use of student ratings, self-reviews, and peer evaluation. Seldin and Associates (1999) provide a useful review of several techniques for evaluating teaching including student ratings, self-evaluation, peer classroom observation, electronic classroom assessment, and portfolios, as well as consideration of the process of implementing teaching evaluation programs in educational institutions.

Student evaluations of teaching (SET) are widely used by economics departments as reported by White (1995) and Becker and Watts (1999). Bosshardt and Watts (2001) investigated the relationship between instructors' assessments of their teaching and their students' assessments. Using the TUCE, the authors found that although student and instructor perceptions of how well the instructor teaches are positively correlated, there are also important differences. "Instructors who speak English as their native language viewed enthusiasm and the ability to speak English as most important in forming their overall self-evaluation. But students of these instructors formed their overall evaluations quite differently, weighting instructor preparation most heavily. The students viewed the instructors' ability to speak English as next in importance, followed closely by grading rigor and enthusiasm.

Still another approach to evaluating teaching is to focus on the amount of student learning in a course, or assessment. Assessment of student learning is a topic that has received increased attention by educational institutions in recent years. This greater attention partially reflects efforts by accreditation agencies to require educational institutions to better define specific learning outcomes, demonstrate learning, and use the assessment results in a cycle of continuing educational improvement. The process of assessment can be an essential element in any systematic objective evaluation of individual students, individual courses, multiple sections of individual courses, programs, or institutions as a whole and as an additional objective means of helping individual faculty members improve their teaching skills.

Walstad (2006, p. 193) notes:

> [A]ttention to teaching methods is important because it shapes the presentation of course content and the nature of classroom contact with students. What is often overlooked, however, is the vital role that assessment can play in helping

> economics instructors do a better job of giving students a better chance to learn economics.

In assessing student learning, one important question is how student learning is to be measured. The relative benefits, as well as costs, associated with use of multiple-choice and essay questions in assessing understanding of economics have been addressed by Walstad and Becker (1994) and Walstad (2001). Advantages of multiple-choice questions include ease of grading (resulting in quick feedback to students on test performance), objectivity in scoring, and greater capacity to sample the content domain as compared with the few questions that can be asked on an essay test. Essay questions require substantially more time to grade and involve less objectivity in scoring. Their work supports the hypothesis that some essay questions add little information to results obtained from well-written multiple-choice questions.

Buckles and Siegfried (2006) conclude that multiple-choice questions can be used to measure some, but not all, elements of in-depth understanding of economics. Using Bloom's (1964) taxonomy of educational achievement, consisting of six levels of cognition: 1) knowledge, 2) comprehension, 3) application, 4) analysis, 5) synthesis, and 6) evaluation, the authors argue that multiple-choice questions can be used to test student achievement for levels one (knowledge) through four (analysis). However, they question whether multiple-choice questions can be used to test students' ability to synthesize and evaluate (Bloom's cognitive levels five and six). They do, however, support the notion that multiple-choice questions can test for more than simple recognition and understanding (corresponding to Bloom's first two academic achievement levels of knowledge and comprehension). Further:

> One additional use of multiple-choice questions, which permits assessment of even higher levels of understanding, is to ask students to choose the correct answer and then to explain why the correct answer is correct and why each incorrect answer is wrong.
>
> Finally, a series of questions that requires students to understand economics progressively more deeply can be used to inform instructors just how successful they have been in helping students learn how to think like an economist. A series of questions first assessing knowledge, then comprehension, next application, and finally analysis may permit instructors to see exactly where students' understanding has stopped and provide guidance as to what to emphasize in review.

Walstad (2006) explores advantages and disadvantages of essay tests and questions to assess higher levels of student understanding of economics and provides guidelines for essay testing and grading. Overall, his conclusion is that:

> [E]ssay testing requires more work than is generally expected by economics instructors, but this commitment needs to be made if essay tests are to be used as an effective and reliable measure for depth of understanding in economics.

Simkins and Allen (2000) used pre- and post-tests in Principles of Macroeconomics courses in order to "evaluate teaching performance on a regular basis as a means of continually improving teaching effectiveness and increasing student learning in the classroom". The pretest used in this study consisted of nine multiple-choice questions, four mathematical problems, and a graphing exercise. Their primary objective was to use an instructor-developed pretest "as a diagnostic and developmental tool for instructors to assess and improve teaching effectiveness". Using the pretest results, instructors were able to modify their delivery of course content by providing more reinforcement of concepts for which the pretest indicated students' skills were lacking. The pretest results can also be used to "give students and instructors early feedback on the need for assistance while there is time to take corrective action through tutoring, extra homework assignments, improved note-taking skills, and other remedial help." Further, "post-testing students at the end of the course using the same questions provides valuable information that can measure student learning, suggest areas for teaching improvement, and improve course delivery." The authors also argue that the ability to use course-specific content in instructor-developed pre- and post-tests is a significant advantage compared to standardized tests.

The TUCE is a standardized test that was developed more than 40 years ago and has been used extensively by instructors and researchers in economics. The test is now in its fourth edition (TUCE-4). Use of the TUCE in economic education has been described by Becker (1997). Separate exams exist for microeconomics and macroeconomics. Each exam consists of 30 multiple-choice questions. According to Walstad and Rebeck (2008):

> As with past editions, the TUCE-4 has two primary objectives: 1) to offer a reliable and valid assessment instrument for students in principles of economics courses; and to provide norming data for a national sample of students in principles classes so instructors can compare the performance of their students on a pretest and a posttest with this national sample.

These authors conclude:

> The TUCE-4 also should be valuable for advancing research in economics education because it provides a standardized test that can be use to assess student achievement in principles of economics across different institutions or classes.

This study extends the literature on using standardized tests to measure and evaluate teaching effectiveness in introductory economics courses by demonstrating how the results

obtained in terms of the six content categories and three cognitive categories that are incorporated in the TUCE can be used as feedback to instructors as a diagnostic and developmental tool to assess and improve teaching effectiveness. In effect, assessment of student learning and evaluation of teaching effectiveness are linked as part of a cycle of continuing educational improvement.[1]

SCOPE OF STUDY AND PROCEDURES

The fourth edition of the Test of Understanding of College Economics (TUCE - 4) was administered as both a pre-and post-test to students in the Principles of Microeconomics and Principles of Macroeconomics courses at Saint Mary's College of California (SMC) during the 2007/2008 academic year. The goals of this process were to provide a consistent mechanism across multiple sections of the Principles courses for assessing how well overall course objectives are being achieved. Traditional student grades and teaching evaluations may not provide sufficiently detailed and consistent information for assessing student learning and the effectiveness of teaching in multiple sections of courses and for evaluating courses in terms of achievement of course objectives.

Six broad content categories are incorporated into the TUCE as a means of insuring "adequate coverage of the basic content of 'typical' college principles courses so that the *total raw score* can be deemed to measure *general understanding* of basic economic principles" and "discriminate among individual students on the basis of their ability to understand and apply selected concepts and principles." (Saunders, 1991, p.2). The comparative effectiveness of courses in achieving the objectives measured by the TUCE can be ascertained by comparing the scores of students with the percentile distributions of the scores of students used to develop norming data for the TUCE. Topics included in each of the six microeconomic and macroeconomic content categories are shown in Appendix A and Appendix B, respectively.

Three cognitive categories also are incorporated into the TUCE. As noted by Saunders (1991, p.3), "all editions of the TUCE have sought to emphasize the *application* of basic concepts and principles…The three broad cognitive categories used to classify questions on the TUCE III are: Recognition and Understanding (RU); Explicit Application (EA); and Implicit Application (IA)." The three cognitive categories on the TUCE-4 are identical to those in the TUCE III. Characteristics of each of these cognitive categories are contained in Appendix C.

We believe that a general goal of economics education, even at the Principles of Economics level, is for students to understand, and more importantly, have the ability to apply economic terms and concepts in actual situations. Within the three cognitive categories, the Explicit Application cognitive grouping is concerned with students' ability to apply the correct economic concepts to solve a problem when the concepts are either given or explicitly mentioned as part of the problem statement and no unstated assumptions are involved. The Implicit

Application category is concerned with students' ability to define or solve a problem when the relevant economic concepts are not explicitly mentioned.

During the first week of the fall 2007 and spring 2008 semesters, the TUCE microeconomics test was administered to students in eight sections of the Principles of Microeconomics course. The same test was administered to students in these courses as one portion of the final exam. A total of 178 students in the Principles of Microeconomics courses took both the pre-and post-tests. Only data for these students are used in this analysis since such "matched" data are consistent with the data selected to norm the TUCE using a national sample of students. Use of matched samples controls for differences in the composition of students taking the pre- and post-tests. Using data for "unmatched" groups of students means that differences in composition of the students taking the pre- and post-tests may account for some of the differences in scores achieved. Overall, data were obtained for four different instructors teaching eight sections of the microeconomics course during the 2007/2008 academic year. Students were allowed nearly an entire 60-minute class period to complete the pre-test and the post-test was incorporated into the final exam in each course as part of a two-hour final exam.

Data for students in the Principles of Macroeconomics courses were obtained during the spring 2008 semester. A total of 54 matched samples of students who took both the pre- and post-tests were used in this analysis. Two instructors each taught two sections of the Macroeconomics principles course, thus providing data for four sections of the course[2].

RESULTS

Principles of Microeconomics Courses

Table 1 shows the mean percentage of correct responses by SMC students and the national sample of students for questions for each of the six microeconomic content categories on both the pre-and post-test TUCE-4. For two of the content categories, the percentage of correct responses by SMC students on the pre-test was only slightly greater than 25 percent which is the result expected from pure guessing on a four-option multiple-choice test. For each of the six microeconomic content categories, scores of SMC students on the post-test were statistically higher than scores on the pre-test at the 0.005 level of significance. Thus, there was a statistically significant improvement in student performance in each of the six content categories between the pre- and post-tests. However, whether or not the differences in scores between Saint Mary's students and the national sample of students were statistically significant on either the pre- or post-test could not be determined because the distribution of the percentage of correct responses for the national sample of students is not reported.

Table 1: Percentage of Correct Responses by Saint Mary's College of California Students and a National Sample of Students, to Questions on the Microeconomics TUCE-4, Grouped by Content Category

	Pre-test			Post-test			
Content Category	**SMC**	**Sample**	**SMC***	**Sample****	**SMC**	**Sample**
	(percentage correct)				(percentage point change)	
Basic economic problem						
Mean score	27.2	29.0	32.3	40.5	5.1	11.5
Markets and price determination						
Mean score	29.6	33.8	51.0	42.7	21.4	8.9
Theories of the firm						
Mean score	28.7	29.4	45.2	45.2	13.1	15.8
Factor markets						
Mean score	36.0	35.0	49.1	42.0	13.1	7.0
(Microeconomic) role of government in a market economy						
Mean score	26.3	30.6	46.8	41.1	20.5	10.5
International economics						
Mean score	32.7	32.0	46.5	40.3	13.8	8.3

* For each of the content categories, scores of SMC students on the post-test were statistically higher than scores on the pre-test at the 0.005 level of significance.

** No conclusion as to whether or not post-test scores of the national sample of students were statistically higher than scores on the pre-test because the distribution of correct responses is not reported.

Table 2: Percentage of Correct Responses by Saint Mary's College of California Students and a National Sample of Students, to Questions on the Microeconomics TUCE-4, Grouped by Cognitive Category

	Pre-test		**Post-test**			
Cognitive Category	**SMC**	**National Sample**	**SMC***	**National Sample****	**SMC**	**National Sample**
	(percentage correct)				**(percentage point change)**	
Recognition and understanding						
Mean score	24.2	28.0	45.1	44.0	20.9	16.0
Explicit application						
Mean score	33.0	34.8	50.1	45.0	17.1	10.2
Implicit application						
Mean score	26.0	27.0	40.0	36.9	14.0	9.9

* For each of the cognitive categories, scores of SMC students on the post-test were statistically higher than scores on the pre-test at the 0.005 level of significance.

** No conclusion as to whether or not post-test scores of the national sample of students were statistically higher than scores on the pre-test because the distribution of correct responses is not reported.

The average percentage of correct responses to questions in each cognitive category on both the pre-and post-test, for SMC students and students in the national sample, is shown in Table 2. On the pre-test, the mean score of SMC students in the RU category was below 25 percent and only slightly above 25 percent for the IA category. For each of the three cognitive categories, scores of SMC students on the post-test were found to be statistically higher than scores on the pre-test at the 0.005 level of significance. In terms of percentage point improvement between the pre- and post-tests, both SMC students and the national sample did best on the RU category and poorest on the IA category.

Principles of Macroeconomics Courses

Table 3 is similar to Table 1 but summarizes data for the 54 SMC students who completed both the pre- and post-test macroeconomics TUCE-4, along with results for the national sample of students.

Table 3: Percentage of Correct Responses by Saint Mary's College of California Students and a National Sample of Students, to Questions on the Macroeconomics TUCE-4, Grouped by Content Category

	Pre-test			Post-test			
Content Category	**SMC**	**National sample**	**SMC**	**National sample**	**SMC**	**National sample**
	(percentage correct)				(percentage point change)	
Measuring aggregate economic performance						
Mean score	34.7	34.8	62.5	53.2	27.8	18.4
Aggregate supply and demand						
Mean score	38.3	37.9	61.1	51.3	22.8	13.4
Money and financial markets						
Mean score	24.1	24.2	50.5	46.2	26.4	22.0
Monetary and fiscal policy						
Mean score	26.2	32.7	57.1	46.9	30.9	14.2
Policy debates						
Mean score	30.2	26.3	51.2	35.0	21.0	8.7
International economics						
Mean score	25.9	31.3	64.2	43.0	38.3	11.7

* For each of the content categories, scores of SMC students on the post-test were statistically higher than scores on the pre-test at the 0.005 level of significance.

** No conclusion as to whether or not post-test scores of the national sample of students were statistically higher than scores on the pre-test because the distribution of correct responses is not reported.

For each of the six content categories, scores of SMC students on the post-test were found to be statistically higher than scores on the pre-test at the 0.005 level of significance indicating that, as for the microeconomic principles course, the macroeconomic course

contributed to a statistically significant improvement in student performance between the pre- and post-tests. However, as noted for the microeconomic results, no conclusion can be drawn as to whether results obtained for SMC students differ from results of the national sample of students because the distribution of scores for the national sample of students is not reported.

Table 4 reports the mean percentage of correct responses to questions in each cognitive category for SMC students and the national sample of students on the pre- and post-test. For each of the three cognitive categories, scores of SMC students on the post-test were found to be statistically higher than scores on the pre-test at the 0.005 level of significance.

Table 4: Percentage of Correct Responses by Saint Mary's College of California Students and a National Sample of Students, to Questions on the Macroeconomics TUCE-4, Grouped by Cognitive Category

	Pre-test			Post-test				
Cognitive Category	**SMC**	**National Sample**		**SMC***	**National Sample****		**SMC**	**National Sample**
	(percentage correct)						(percentage point change)	
Recognition and understanding								
Mean score	25.0	27.3		58.3	46.3		33.3	19.0
Explicit application								
Mean score	33.0	34.1		56.4	48.8		23.4	14.7
Implicit application								
Mean score	31.7	33.8		62.0	45.4		30.3	11.6

* For each of the cognitive categories, scores of SMC students on the post-test were statistically higher than scores on the pre-test at the 0.005 level of significance.

** No conclusion as to whether or not post-test scores of the national sample of students were statistically higher than scores on the pre-test because the distribution of correct responses is not reported.

In terms of percentage point improvement between the pre- and post-tests, SMC students did best on the RU category and poorest on the EA category. Students in the national sample also showed the greatest improvement in the RU category but did poorest on the IA category.

Interpretation of Results

For both the microeconomics and macroeconomics courses, scores of SMC students on the post-test in each of the six content categories were significantly higher than on the pre-test implying a substantial increase in their knowledge of economic concepts.

In microeconomics, SMC student scores improved least in the Basic Economic Problem Category, suggesting that instructors need to focus more on this category, perhaps by devoting more time and attention at the outset of the principles courses to consideration of fundamental economic concepts. This result is reinforced by the fact that improvement of SMC students in this category was less than one-half of the percentage point improvement by the national sample of students. In all other categories, with the exception of Theories of the Firm, SMC students

showed greater improvement than did the national sample. However, it cannot be inferred that the improvement is statistically greater.

The results also suggest that instructors need to devote greater time and attention to theories of the firm, factor markets, and international economics because improvement of SMC students in these three categories was substantially less than in the two categories for which students showed the greatest improvement. The lower performance of SMC students in the Theories of the Firm category is likely of greatest concern. Anecdotal evidence suggests that factor markets and international economics are often given short shrift in many SMC Microeconomics Principles courses because they tend to be covered near at the end of each term when less time is available to be devoted to them. It seems likely that similar practices exist in many of the principles courses taken by the national sample of students.

In macroeconomics, SMC students improved their scores between the pre-and post-test substantially more than did the national sample in each of the six content categories, implying a relatively high degree of learning by SMC students because students in each group were about as well prepared based on their performance on the pre-test. Differences in the extent of improvement in each of the six Content Categories offers instructors information as to subjects in which some increased attention might be focused in the future.

With regard to all three of the Cognitive Categories, improvement of SMC students in both microeconomics and macroeconomics was greater than that of the national sample. Further, improvement in each of the three categories in macroeconomics was considerably higher than was achieved in microeconomics. This same result was also observed for the national sample, although the disparity in results was not as great as for SMC students. The difference in results may merely reflect greater student awareness of topics in macroeconomics as compared with microeconomics but is a matter for departmental consideration, especially because performance on the pre-test, in both microeconomics and macroeconomics was similar for the two groups.

Improvement of SMC students in microeconomics was greatest in the RU category and least in the IA category, implying that SMC students are learning the most fundamental concepts best but, as the level of abstract thinking increases, the improvement is much less. This is a cause for concern and a matter which instructors need to give more attention in preparing their courses. The greatest percentage point improvement for macroeconomics courses was also in the RU category, again indicating that students are substantially improving their knowledge of basic macroeconomic terms and concepts. Improvement between the pre-and post-test was smallest for the EA category, indicating the need for strengthening instruction in problem solving using specific concepts. Still, in comparison with the national sample, the results indicate that SMC teaching is quite effective in all three of the cognitive categories, but provide information that instructors can utilize to further improve their teaching effectiveness.

Overall, the results in both microeconomics and macroeconomics are a cause for some concern about the effectiveness of teaching because they indicate that students gained most in terms of recognition and understanding of economic concepts but did not improve as much in

terms of comprehension and application of concepts. The implication for economics instructors is that less emphasis should be given to memorization of terms and concepts and more emphasis given to application of terms and concepts in problem-solving. The results achieved may also relate to introductory economics courses including coverage of a broad range of topics. The effect may be that students gain familiarity with topics but are unable to use them effectively either in explicit or implicit applications. One solution may be to pursue the idea that "less is more" in introductory economics courses by covering a smaller number of topics in greater depth rather than covering a large number of topics that students are not able to apply, and are likely to soon be forgotten. The matter of depth versus breadth of coverage in economics principles courses is, of course, a matter of considerable debate within the economics profession at present.

CONCLUSIONS AND IMPLICATIONS

The TUCE provides instructors in introductory economics courses with an objective means of assessing student learning as well as a means of evaluating their teaching effectiveness. The effectiveness of teaching can be evaluated in two different ways: 1) improvement of student scores between the pre-and post-test; and 2) improvement of student scores relative to improvement by a national sample of students. In addition, by using the content and cognitive categories incorporated in the TUCE, instructors have a diagnostic and developmental tool to identify both specific course content and cognitive areas on which to focus, in terms of devoting additional class time and attention or by altering teaching strategies, as a means of improving teaching effectiveness. The objective information gleaned from this process can be used in conjunction with student evaluations of teaching.

Using the results obtained from use of the TUCE in introductory economics courses, individual instructors can establish goals for improvement in students' mean scores between the pre-test and post-test in each of the six content areas and the three cognitive categories. Progress in meeting such goals can then be monitored as part of an ongoing assessment process that is increasingly being requested by accrediting agencies. Further, the results can be used by instructors as a guide to help them improve their teaching effectiveness.

Further refinement of the procedures outlined in this paper can be achieved by selection of a subset of questions on the TUCE to obtain a better match with the actual content included in a specific course. For example, if international economics is typically covered in the Macroeconomics principles course at an institution, questions on international economics can be eliminated from the pre-and post-test to provide more useful results tailored to that microeconomics course.

Lastly, use of the TUCE pre- and post-test procedure requires a considerable amount of class time and resources for analysis so, while the procedure can provide useful results, it is not advocated for use in each principles course each term. Rather, the procedure might be thought of as a means of periodic assessment of courses and programs as well as comparison of results over

time and across instructors. The procedure could also be used for specific courses in which specific problems have been identified and follow-up action is required.

A significant advantage of the TUCE is that it provides an objective evaluation of student performance and measures outcomes that can be used as a diagnostic and developmental device by instructors. Another advantage of the TUCE relative to other instruments for assessing student learning and teaching effectiveness is that results can be used to measure improvement of students in a given class with improvement of a national sample of students to provide a benchmark for comparison of student learning and effectiveness of teaching. Improvement in student learning is likely to be a direct result of improved methods of evaluating teaching and using such results in an ongoing process to improve teaching effectiveness.

ENDNOTES

[1] We recognize that performance on the TUCE reflects student aptitude in addition to teaching effectiveness. However, we believe the test provides one means of evaluating teaching effectiveness which, in combination with others, can assist instructors in promoting student learning.

[2] We report the performance of SMC students across all sections in which the TUCE was administered. While our intent was to assess the effectiveness of the Economics Department as a whole, the test can also serve as a way to assist individual instructors in gauging their teaching effectiveness.

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APPENDIX A

Microeconomic Content Categories on the TUCE – 4

A. The Basic Economic Problem (scarcity, opportunity cost, choice)
B. Markets and Price Determination (determinants of supply and demand, utility, elasticity, price ceilings and floors)
C. Theories of the Firm (revenues, costs, marginal analysis, market structures)
D. Factor Markets (wages, rents, interest, profits, income distribution)
E. The (Microeconomic) Role of Government in a Market Economy (public goods, maintaining competition, externalities, taxation, income redistribution, public choice)
F. International Economics (comparative advantage, trade barriers, exchange rates)

Source: Walstad, Watts, and Rebeck, 2007

APPENDIX B

Macroeconomic Content Categories on the TUCE - 4

A. Measuring Aggregate Economic Performance (GDP and its components, real vs. nominal values, unemployment, inflation)
B. Aggregate Supply and Aggregate Demand (potential GDP, economic growth and productivity, determinants and components of AS and AD, income and expenditure approaches to GDP, the multiplier effect)
C. Money and Financial Markets (money, money creation, financial institutions)
D. Monetary and Fiscal Policies (tools of monetary policy, automatic and discretionary fiscal policies)
E. Policy Debates (policy lags and limitations, rules vs. discretion, long run vs. short run, expectations, sources of macroeconomic instability)
F. I nternational Economics (balance of payments, exchange rate systems, open-economy macro)

Source: Walstad, Watts, and Rebeck, 2007

APPENDIX C

Definitions of Cognitive Categories Used to Classify Questions on the TUCE - 4

(RU) Recognizes and Understands Basic Terms, Concepts, and Principles

1.1 Selects the best definition of a given economic term, concept, or principle
1.2 Selects the economic term, concept, or principle that best fits a given definition
1.3 Identifies or associates terms that have closely related meanings
1.4 Recalls or recognizes specific economic rules, e.g., an individual firm's profit is maximized at the level of output at which marginal cost equals marginal revenue

(EA) Explicit Application of Basic Terms, Concepts, and Principles

2.1 Applies economic concepts needed to define or solve a particular problem when the concepts are explicitly mentioned
2.2 Distinguishes between correct and incorrect application of economic concepts that are specifically given
2.3 Distinguishes between probable and improbable outcomes of specific economic actions or proposals involving no unstated assumptions
2.4 Judges the adequacy with which conclusions are supported by data or analysis involving no unstated assumptions

(IA) Implicit Application of Basic Terms, Concepts, and Principles

3.1 Applies economic concepts needed to define or solve a particular problem when the concepts are not explicitly mentioned
3.2 Distinguishes between correct and incorrect application of economic concepts that are not specifically given
3.3 Distinguishes between probable and improbable outcomes of specific economic actions or proposals involving unstated assumptions
3.4 Judges the adequacy with which conclusions are supported by data or analysis involving unstated assumptions

Source: Walstad, Watts, and Rebeck, 2007

IS THERE SUCH A THING AS A FREE TEXTBOOK?

Simon Medcalfe, Augusta State University

ABSTRACT

Students are being given greater choice over how they access textbook material for classes. This study examines the relationship between student choice and overall performance in an Introduction to Economics class. Simple averages suggest free online access to a textbook is associated with a grade one full letter lower than if that student had bought a traditional textbook. However, once we control for the endogeneity of student choice there is no significant difference in grade between those students who buy a traditional textbook and those that access the material in a different manner.

There is an increasing variety of ways in which students can access their textbooks. Many students still use the traditional textbook, but publishers have started to offer a number of other options. For example, students can access an e-text version. This is often a PDF version of the traditional textbooks that may include the opportunity to search the text and other options. The success of Apple products, most recently the ipad, has allowed publishers to offer ibook versions of their text for a variety of e-readers. Despite the increasing variety of textbook formats little research has been conducted into how these different formats affect student understanding. This paper provides initial observations on student achievement in economics when they are provided with a variety of choices about how they access the textbook material. The results suggest that there is no difference in student outcomes.

LITERATURE REVIEW

There has been much research into effective teaching of economics including the role of homework and assignments, peer effects, and technology. Further, there have been a number of studies examining the differential effect of online versus face-to-face teaching.

Frank (2002) described "The Economic Naturalist", a set of assignments used to teach introductory students how to speak economics. Students had to use an economic principle to explain some pattern of events or behavior that they had personally observed. Although no quantitative evidence was provided to show improved learning and understanding, anecdotal evidence suggested that students did become better speakers of economics with their classmates, families, and beyond the course.

Joerding (2010) found that students who received unique homework exercises did better on subsequent exams than students who received traditional paper assignments that were identical across students. The suggestion is that unique assignments encourage student to find

solutions to problems rather than just answers. Lee, Courtney, and Balassi (2010) however, found that students did no better, or worse, when using the Aplia online homework system compared to traditional paper assignments. It is not clear whether students were assigned unique questions in Aplia. One problem with these kinds of studies is that they compare one group of students who completed paper assignments with another group who completed Aplia assignments. This makes it difficult to know whether differences are due to the type of assignment or difference between one class and the other. Kennelly, Considine, and Flannery (2011) overcame this problem by using one set of students who completed some assignments on paper and some on Aplia. They found little evidence that the way a student completed an assignment has an effect on how they performed on the related exam question.

Parker (2010) using student performance data from 9 years of an undergraduate macroeconomics class found no evidence of free riding in effort of weaker students in collaborative assignments. Both students contributed to assignments in proportion to their abilities. He pointed out that this may be specific to his institutions and warns of extrapolating results to other institutions and courses. Munley, Garvey, and McConnell (2010) develop further the idea of peer effects by analyzing the effectiveness of peer tutoring. Peer tutoring programs typically utilize advanced undergraduates who have successfully completed the course to lead a small group of enrolled students through some problem solving sessions. The evidence from over 14,000 students was that an hour per week of peer tutoring increased the student's grade by 0.3 on a four point scale (e.g. from a B to a B+).

Technology has increasingly been advocated to enhance instruction but studies provide mixed results on its efficacy. Savage (2009) for example found no difference in student performance when one section of an Intermediate Macroeconomics course could access recordings of the lectures after the class via the internet. Savage suggested the lack of difference may be because the recording did not add anything new that was not already covered in class. Ghosh and Renna (2009) experimented with a Personal Response System that allowed students to anonymously answer questions and provided the instructor and student with real-time assessment of learning. In a survey, students overwhelmingly welcomed the technology for its ability to reinforce concepts and gauge their understanding. They were less certain that it improved their performance in class. Salemi (2009) reported that 85 percent of students in a Principles of Economics class thought "the use of clickers helped me to learn".

Studies of online versus face-to-face instruction have similarly returned mixed results. Coates, Humphreys, Kane and Vachris (2004) found that, after correcting for selection bias, online students performed significantly worse than face-to-face students on the Test of Understanding College Economics. However, online students did better than they would have in a face-to-face class. Brown and Leidholm (2002) found online students performed worse on examinations than face-to-face students. Medcalfe (2009) however, found no significant difference in grades of adult learners.

Few studies have actually looked at textbook choice. One notable exception is Pyne (2007) who examined the (instructors) choice of textbook. He found some evidence that the choice of introductory microeconomics textbook did affect student outcomes in subsequent economics courses (intermediate microeconomics and money and banking). However, there has been no research examining student choice of textbook access and outcomes.

THE UNIVERSITY AND THE COURSE

Augusta State University (ASU) is a member of the University System of Georgia (USG). It currently offers more than 50 programs of study leading to bachelor, masters and educational specialist degrees. In fall 2009, there were 7,061 students enrolled at the institution (6,718 in spring 2010). In fiscal year 2009, 608 bachelor's degrees were conferred. The freshman retention rate in 2007/2008 (the latest year data is available) was 69% within the institution and 73% within the USG. The six year baccalaureate degree graduation rate for the 2003 cohort was 21% within ASU and 28% in the USG.

Introduction to Economics is a course aimed at non-business majors offered twice a year (once in the fall and once in the spring semester). The core curriculum of all bachelor degrees at ASU requires 12 credit hours in social sciences. Students are required to take an American history and American government class and must choose one of four courses: Introduction to Economics, Cultural Anthropology, Introduction to General Psychology, or Introduction to Sociology (along with one other course). A broad range of majors are represented in a typical Introduction to Economics class including, but not limited to: engineering, nursing, sociology, history, English and education. Sixty five percent of the students were freshmen or sophomores in fall 2009, and 76% were in spring 2010. Sixty nine students gave permission for their data to be used in this study (35 in the fall and 34 in the spring semester). Students were assessed using a combination of exams and homework, as well a paper and a presentation.

The assigned textbook in the course was *Principles of Economics* by Timothy Taylor available from textbookmedia.com. The website provided the following choices for accessing the textbook:

1. Sponsored Online Book: Free access to the online book. Includes StudyBreak Ads (advertising placed in natural subject breaks). NOTE: No printing. Study Guide not included. Price: $0.00.
2. Online Book (ad-free): Ad-Free version of online book. NOTE: No printing. Study Guide not included. Price: $9.95.
3. Digital Bundle: PDF Chapters + Online Book: BEST VALUE: Printable version of ad-free online textbook. 710 pages. Includes downloadable PDF chapters for easy self-printing. Price: $19.95.
4. Hybrid Bundle: Paperback + Online Sponsored Book: Provides students with print and online versions of the textbook for convenience and easy access. Includes an affordable

print version of the book (with no ads). This black & white paperback is shipped directly to you (allow 5-7 business days). Savings compared to traditional Economics textbooks: $100+. Use the Sponsored Book version while waiting for paperback delivery. Price: $29.95.

RESULTS

Students in the fall 2009 semester were not given any guidance or instruction about which mode of accessing the textbook should be used. However, students who bought the traditional textbook (Hybrid Bundle) earned a course grade about 10 percentage points higher than those who accessed the free online text. Students in the spring 2010 semester were informed of this difference in grade to allow then to make the most well informed choice. Despite this advice, more students (14) chose to access the textbook free online rather than buy a traditional copy (11). Moreover, the students that bought the traditional textbook earned a grade 3 percentage points higher than those that used the free textbook. Summary statistics of this data are presented in table 1.

Table 1: Summary Statistics

	Fall 2009			Spring 2010		
	Number	Mean Grade	S.D.	Number	Mean Grade	S.D.
Free	13	72.0	9.6	14	70.0	9.0
Ad-free	2	69.1	3.1	1	82.8	n/a
Digital bundle	2	76.0	20.4	2	88.3	5.2
Traditional	13	82.2	8.6	11	73.2	7.5
None	5	71.5	9.2	6	65.1	9.2

Obviously, other factors can contribute to a course grade besides accessing the textbook. The following section uses regression analysis to better understand how accessing the textbook affects course grades. Other information about the students was collected either from a survey (appendix A) or directly from university records (GPA). The OLS regression results are presented in column 1 of Table 2. The coefficient on the free variable suggests that those students who chose the free access earned a grade for the course about 5 percentage points lower than those students who used a traditional textbook. The only other significant variable of interest is the GPA. A one point increase in GPA (say from 2.5 to 3.5) is associated with a higher grade in the course of about 8 percentage points.

Table 2: Regression results.		
	OLS	IV
Intercept	55.43***	59.85***
	(5.61)	(3.33)
None	-3.56	-6.29
	(1.08)	(0.64)
Free	-5.07**	-9.79
	(2.00)	(0.54)
Adfree	-6.51	-8.89
	(1.29)	(0.92)
Digital bundle	5.21	3.41
	(0.86	(0.39)
Freshman	-3.58	-3.45
	(0.97)	(1.16)
Sophomore	-0.20	0.91
	(0.06)	(0.18)
Junior	-1.78	-0.98
	(0.41)	(0.22)
GPA	8.20***	7.27*
	(3.04)	(1.84)
R-squared	0.41	0.38
N	69	69
note: absolute robust t statistics in parentheses.		

One problem with the OLS regression however, is that the choice of access is endogenous. The traditional econometric way to deal with this endogeneity is to use an instrument variable that is correlated with the textbook choice but not with the grade. One variable that was identified was the number of laptops the student had access to. The correlation between laptops and free was 0.26 and between laptop and grade was 0.16. Using laptop as an instrument variable (IV) for free access results in the IV regression results in column 3 of Table 2. Although the coefficient on the free variable is similar in magnitude to the difference in average scores for the fall 2009 semester, it is not significantly different from zero. Again, the only significant variable of interest is GPA, where a one point increase in GPA is associated with a 7 percentage point increase in grade.

DISCUSSION

Before investigating the relationship between textbook access and student outcomes, there was no preconceived idea about the relationship. Some factors suggest that students may do better with a traditional textbook and others that they would do worse. A traditional textbook, for example, may be a physical reminder of the need to study. An electronic version is hidden in the midst of their computer and the internet. A student may turn on their computer with the intention

of pulling up the e-text, but gets distracted by Facebook, YouTube, email and any number of other distractions. However, today's generation of students has grown up in an electronic age. They may be more familiar with, and used to, accessing information electronically. Additionally, they may be used to reading computer screens for hours on end.

Other issues that this study raises include the extra choices available to students. First, once upon a time, textbooks could only be accessed by buying a book. Now they can be downloaded online, to digital devices such as iPads and eReaders. However, previous research has shown that too much choice may be bad (Iyengar and Lepper, 2000). Given too much choice of jams in grocery stores shoppers did not buy any. Similarly, too much choice over accessing textbooks may paralyze the student and they do not buy any. In this study, 16% of students did not access the textbook at all. Whether this is higher than normal is not ascertainable from the current data. Second, students have difference learning styles so a free online textbook may be appropriate for some students but not others. However, students may make poor choices because they do not understand their learning styles. If this was true, then we would expect to see freshman and sophomores making lower grades than juniors and seniors who have had time to understand how best they study. This hypothesis is not supported by the results in Table 2 where there is no significant difference between the grades earned by freshmen and other classmen. Also 25% of freshman chose the free access as did 25% of seniors. However, 54% of sophomores did choose the free text compared to 44% of juniors. Finally, students will consider ability to pay when making their textbook choice. However, whether they or their parents bought their textbooks had no effect on their choice.

CONCLUSION

Although this study used a non-traditional publisher of textbooks, the mainline publishers are also offering students a variety of ways to access the required textbook including eTexts, eBooks, and iPad aps. This increased choice over access to textbooks raises the need to know how student choices affect their performance in classes. The results of this study suggest that how students access their textbook does not affect their grade in the course. Overall, this study most closely reflects the findings of Lee, Courtney, and Balassi (2010) and Kennelly, Considine, and Flannery (2011) in that today's student is able to complete homework, or read textbooks, online without affecting their performance in class.

However, caution should be attached to this statement. First, the sample size is relatively small at 69 students. It would be hard to extrapolate these results to other students, courses, or institutions. Larger studies, over a number of courses and universities should be conducted to confirm the robustness of these findings. Second, other independent variables may be included that are correlated with success in economics courses. Previous studies have included math skills (Pyne, 2007), student characteristics, such as race, gender, age (Coates et al., 2004), and standardized test scores and/or some measure of high school performance (Brown and Liedholm,

2002; Munley et al., 2010). Third, there was no random selection of students. In fact few previous studies use a random selection of students. One notable exception is Savage (2009) where students were randomly assigned to comparison (lecture recording and posting on the internet) and tests groups. While other studies, as well as this one attempt to correct for selection bias more randomized studies would be useful. Failing that, attempts should be made to find a better instrument variable to appropriate the choice of access.

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APPENDIX A

ECON 1810 Textbook Survey

You are not required to answer any of these questions and your participation is completely voluntary. If you do not wish to participate please leave the survey blank. Thank You.

ID number:__927_____

1. Please circle the letter below indicating below how you accessed the Textbook Principles of Economics by Timothy Taylor:

a. Free access to the online book which includes "study break ads". This option does not allow printing.
b. An ad-free version of the online book which again does not allow printing (cost $9.95).
c. A printable ad free online textbook with downloadable PDF chapters (cost $19.95).
d. A "traditional" black and white textbook is mailed to the students (cost $29.95).
e. Did not access the textbook at all.

2. Please indicate the number of computing devices you have access to.
_____Desktop computer
_____Laptop computer
_____Netbook computer

3. What is your current academic standing?
_____Freshman
_____Sophomore
_____Junior
_____Senior

4. Who buys your textbooks?
_____I buy my own textbooks
_____My parents buy my textbooks
_____Other (please specify)

THE DEBT INDEX AND ITS RELATION TO ECONOMIC ACTIVITY

John J. Bethune, Barton College

ABSTRACT

The misery index was created by Arthur Okun to serve as a measure of economic well-being. It combines the inflation rate and the unemployment rate to gauge economic performance. During the 1970s and 1980s the index was useful as a tool to discuss stagflation and the performance of governing authorities in how well the economy was being managed.

With expanding national indebtedness and seemingly endless deficit spending, the United States and the world's economies appear to face different issues that move beyond inflation, unemployment, and sluggish growth rates. While there are clearly empirical relationships for these variables to debt and deficit levels, we do not currently have an index that shows explicitly how debt might affect economic activity.

This paper combines debt and deficit ratios to develop a "debt index" for several national economies and uses this measure to show how private investment and other economic measures are affected by a nation's debt troubles.

THE DEBT INDEX

There are both short run and long run issues involving the debt problem in the United States and elsewhere. In the short run, the deficit represents a problem for policy makers while in the long term, the national debt is an issue that must be addressed.

To construct a "debt index" I combine the absolute value of the annual federal budget deficit divided by federal government spending with the national debt divided by nominal GDP. Put simply:

Deficit/Spending + Debt/GDP = Debt Index

This combines the temporal aspects of our short and long term debt problems into one measure.

The Relation of the Debt Index to Macroeconomic Variables

To determine if the debt index had any meaningful statistical relationship with various macroeconomic variables I generated a series of correlation coefficients comparing the debt index with these variables on an annual basis since 1980. A major finding was that the debt

index was highly and negatively correlated with private investment as a percent of GDP. The coefficient was -.831 and it was significant at the 99 percent confidence level.

It might be expected that other measures of debt might be highly and/or more so correlated with investment as a percent of GDP so I ran correlations with these as well. The results are in Table I.

Table I: Debt Measures and Private Investment Correlation Coefficients	
Debt Variable	Correlation Coefficient
Annual Deficit	-.749
Annual Debt	-.640
Annual Deficit/Government Spending	-576
Annual Debt/GDP	-.766
Debt Index	-.831

Table I demonstrates that the relationship of the debt index to private investment is greater than any individual component of the index.

A simple regression was run to suggest the explanatory power of the relationship between the debt index and investment spending. The results were:

Regression Analysis: I/GDP versus Debt Index

The regression equation is

I/GDP = 23.8 - 6.28 Debt Index

Predictor	Coef	SE Coef	T	P
Constant	23.8483	0.5935	40.18	0.000
Debt Index	-6.2818	0.7675	-8.19	0.000

S = 0.979482 R-Sq = 69.1% R-Sq(adj) = 68.0%

While this is a fairly simplistic method of determining explanatory power it does show, according to the adjusted R-Square, that the debt index explains 68 percent of the movement in private investment.

To determine how robust this relationship might be I used IMF data, going back to 1980, when possible, to construct a debt index for 15 major global economies of vary characteristics. The results can be seen in Table II.

Table II: Debt Index Correlations with Private Investment	
USA	-.831
Greece	-.666
Italy	-.729
Japan	-.952
Sweden	-.784
UK	-.740
Germany	-.807
Australia	-.502*
New Zealand	-.311**
Canada	-.460*
France	.057**
Iceland	-.792
Ireland	-.672
Spain	-.402*
Portugal	-.805
*Significant at the .05 percent level. **Not significant at the 10 percent level.	

Accept where noted, all coefficients are significant at the 1 percent level in Table II as well as all of the following tables. This would indicate that the debt index is highly and negatively correlated with most western-style economies. This would include Sweden, where a large percentage of GDP flows through the public sector. France and New Zealand are the only economies where the relationship does not hold.

Another variable exhibiting a significant relationship with the debt index is the unemployment rate. For the United States, the correlation coefficient is .479 and it is significant at the 1 percent level. This implies that higher levels of short term and long term debt correspond to higher levels of unemployment. However, in this case the deficit and deficit to government spending ratio are more highly correlated with unemployment than the debt index, with coefficients of .626 and .824, respectively. In contrast the national debt and the debt to GDP ratio are not significantly correlated to the unemployment rate, indicating that unemployment is related much more closely to short run debt difficulties in the United States.

Table III shows the correlation coefficients among the various countries with respect to the debt index and unemployment.

Table III: Debt Index Correlations with the Unemployment Rate	
USA	.479
Greece	.686
Italy	.524
Japan	.911
Sweden	.620
UK	.132**
Germany	.216**

Table III: Debt Index Correlations with the Unemployment Rate	
Australia	.728
New Zealand	.436
Canada	.881
France	-.061**
Iceland	.885
Ireland	.941
Spain	.692
Portugal	.792
*Significant at the .05 percent level. **Not significant at the 10 percent level.	

Unlike in the case of the USA, none of the countries that show a significant correlation coefficient have higher coefficients on the relationship with the short term deficit measures. Some, such as Greece, Canada, and Australia, show a more significant correlation with the debt to GDP ratio. In all other cases the debt index outperforms all other measures in the size of the correlation coefficient.

One might make the argument that higher rates of unemployment might be better explained by declining private sector investment or falling GDP. Table IV shows these correlations.

Table IV: The Unemployment Rate Correlations with Private Investment and GDP		
Country	Private Investment	GDP
USA	-.435	-1.71**
Greece	-.549	.655
Italy	-.466*	-.602
Japan	-.929	.613
Sweden	-.508	-.391*
UK	.018**	-.511
Germany	-.414*	.148**
Australia	-.828	-.787
New Zealand	-.672	-.621
Canada	-.672	-.621
France	-.721	,073**
Iceland	-.678	.595
Ireland	-.714	-.658
Spain	-.855	-.404*
Portugal	-.926	.759
*Significant at the .05 percent level. **Not significant at the 10 percent level		

Table IV shows that private investment is more highly correlated with unemployment than the debt index in the following countries: Japan, Germany, Australia, New Zealand, France, Spain, and Portugal. These countries have a GDP more highly correlated with unemployment

than the debt index: Italy, Australia, and New Zealand. Otherwise, the debt index is better correlated with unemployment than these better known variables.

The Debt Index through Time

Table V shows the value of the debt index in the selected countries since 2000.

Table V: Debt Index through Time

Date	USA	Greece	Italy	Japan	Sweden	UK	Germany	Australia	New Zealand
2000	0.441	0.853	1.110	1.626	0.471	0.372	0.573	0.146	0.281
2001	0.495	0.907	1.152	1.687	0.517	0.361	0.651	0.148	0.241
2003	0.666	0.961	1.120	1.826	0.553	0.424	0.684	0.123	0.196
2003	0.791	1.099	1.117	1.889	0.541	0.469	0.727	0.086	0.138
2005	0.809	1.151	1.114	1.961	0.495	0.487	0.742	0.059	0.088
2005	0.764	1.123	1.150	2.058	0.466	0.503	0.757	0.037	0.057
2006	0.733	1.197	1.135	2.029	0.401	0.496	0.714	0.046	0.067
2007	0.703	1.197	1.067	1.948	0.333	0.505	0.644	0.058	0.081
2008	0.848	1.305	1.118	2.067	0.343	0.635	0.661	0.140	0.184
2009	1.244	1.565	1.263	2.420	0.445	0.902	0.805	0.279	0.347
2010	1.307	1.638	1.279	2.431	0.403	0.973	0.909	0.338	0.485
2011	1.457	1.697	1.292	2.578	0.343	0.993	0.863	0.333	0.522

Date	Canada	France	Iceland	Ireland	Spain	Portugal
2000	0.749	0.602	0.372	0.209	0.618	0.513
2001	0.811	0.601	0.474	0.245	0.572	0.570
2003	0.808	0.652	0.476	0.266	0.538	0.562
2003	0.768	0.708	0.467	0.215	0.493	0.558
2005	0.704	0.719	0.344	0.157	0.471	0.5807
2005	0.677	0.723	0.138	0.107	0.405	0.687
2006	0.663	0.684	0.149	0.034	0.343	0.648
2007	0.625	0.694	0.163	0.109	0.313	0.754
2008	0.708	0.745	0.715	0.422	0.499	0.795
2009	0.944	0.923	1.055	0.720	0.776	1.033
2010	0.966	0.949	1.037	1.265	0.807	1.110
2011	0.942	0.973	1.102	1.217	0.817	1.182

For most countries the debt index increased significantly after the global financial crisis of 2008. Only Sweden has returned to pre-2008 levels.

If the debt index is in and of itself a harbinger of major problems in the future it would be clear that Japan is the most likely country to face the prospects of severe economic consequences. Investment as a percent of GDP has fallen from 32.3 to 21.4 percent since 1980

and the unemployment rate has risen from 2.0 to 4.9 percent. The debt index would predict that these trends will hold in the future.

After Japan, Greece carries the highest debt index and its economic problems have been well covered by the world media. Unfortunately, the United States has the next highest debt index and our private investment has fallen from 21 to 16 percent of GDP since 1980 and the unemployment rate remains high by historic standards.

Other countries that have been noted as facing fiscal problems, such as Spain, Italy, Portugal, and Ireland, have debt indexes below that of the U. S. which should give policy makers cause for concern.

SUMMARY

At present, policy makers do not have a useful index to show the problem of public sector debt and how it might relate to current and future economic activity. Given the concerns over deficit and debt problems both in the U. S. and abroad, a tool to measure this might be useful. This paper combines short term and a long term measures to develop the debt index. This index is then used to show how it relates to certain measures of economic activity.

Debt problems are shown to be related to lower private investment levels and higher unemployment rates. For the latter, the debt index is more strongly correlated with the unemployment rate than is the traditional correlation of unemployment and GDP.

Finally, the debt index predicts severe fiscal problems, in order, for Japan, Greece, and the United States. The problems for the U. S. may be more severe than those of Italy, Spain or Portugal.

USING REFLECTION PAPERS IN PRINCIPLES OF MACROECONOMICS CLASSES

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ABSTRACT

Economics teachers constantly try to find better ways to help students apply the material learned in economics classes. Previous research (Powell and López, 1989) demonstrates deeper learning takes place when students recognize how course content directly relates to their daily lives, and when they reflect on their own experiences, rather than memorizing content from textbooks. Facilitating students' realization of how much the topics in "Principles of Macroeconomics" relate to their daily lives while giving them the chance to reflect on the material, we instructed students to write several reflection papers over the course of a semester. We compared examination scores of students who wrote reflection papers with students who did not write reflection papers to identify if writing reflection papers helped students retain significant amounts of material covered during class.

INTRODUCTION

Writing is important for students of economics on many levels. Not only is the ability to write an important skill for the job market, but writing is also a tool that helps students to develop critical thinking and discernment skills. Furthermore, writing as part of an economics class makes the learning process more active and becomes an important assessment tool for higher-level learning. Hence, several authors suggest including writing as a means of assessment in economics classes for testing higher-level learning skills while preparing students for national job markets (Becker, 1997; Emig, 1977; Walstad, 2001). This study targeted one particular form of writing—reflective writing—to examine if reflective writing assignments impact the exam performances of students. Brewer and Jozefowic (2006) found "integrating open-ended journal assignments and reflection papers" in Principles of Economics classes to be an "effective tool for breathing life into class dynamics and fostering the development of higher-level thinking and analytical skills." However, their study was qualitative; our quantitative study adds empirical evidence to their findings and thus helps further develop the understanding of impacts of reflective writing on student performance in economics.

In the following sections we start by considering the literature on writing in economics in general, since this literature provides an insight into the empirical tradition of evaluating writing in economics. We then present the study methodology and data description. This is followed by

the discussion of the results. The paper concludes with a summary of the major findings, implications for teaching practices and suggestions for future research.

WRITING IN ECONOMICS

Reflective writing is a new idea in economics and it has not been studied empirically. However, the importance of writing in general has been recognized for the additional benefit of improving student learning and retention of information; as a result writing assignments have been introduced to economics classes. These writing assignments have been studied empirically in order to evaluate their impact on students' success.

Research suggests that writing benefits student learning (Bangert-Drowns et al., 1991; Butler and Winne, 1995; Langer and Applebee, 1987; Hayes and Flower, 1980; Hayes, 2000; Winne, 1997, 2001) and in particular improves learning in economics classes by introducing an active learning component (Crowe and Youga, 1986; Simpson and Carroll, 1999). Furthermore, Chizmar and Ostrosky (1998), Dynan and Cate (2005, 2009), Greenlaw (2003), and Stowe (2010) identify various forms of writing assignments (one minute papers and more comprehensive writing assignments), which improved examination performance for students in economics classes. However, the empirical studies by Chizmar and Ostrosky (1998) and Stowe (2010) focused on one-minute papers used only one class as the treatment group, and thus the results of these studies could potentially be spurious due to selectivity bias or the behavior of the instructor. The empirical studies by Dynan and Cate (2005 and 2009) and Greenlaw (2003) that concentrated on more comprehensive forms of writing required students to write several (up to 10) longer papers and thus required very labor intensive grading and evaluation by instructors. It would not be realistic to ask economics instructors teaching four or more classes each semester to start engaging in such labor-intensive evaluation and feedback practices, even if student performance outcomes might improve.

This study concentrated on reflective writing as described by Brewer and Jozefowic (2006). At the same time, we advance the understanding of writing in general by using a smaller number of writing assignments (three) and prolonging the study duration to three semesters. In such a way, our approach to writing in economics classes could be used by any economics instructor without adding an unmanageable workload, and the empirical analysis provides enough rigor to draw valid and generalizable conclusions.

METHODOLOGY

The study objective was determining if short reflection papers (150-300 words) improved student learning as measured through examination performance. However, instead of asking students to write six reflection papers as Brewer and Jozefowic (2006) did, students were asked to write three reflection papers to decrease instructor's workload for grading and evaluation.

While the literature finds including writing assignments into the economics curriculum positively affects students' exam performance, many instructors do not follow the recommendations of the literature due to the increased time required for evaluating these assignments. Thus, the goal of this study is twofold: we not only set out to determine if reflective writing affects examination performance positively, but also if three reflective papers are enough to make an impact on student learning and course performance.

For each reflection paper students can choose a topic to be covered on an upcoming examination. During the study, three sections of "Principles of Macroeconomics" students completed reflective writing assignments (one per semester). The study also included four sections of students in "Principles of Macroeconomics" who did not write reflective papers as a control group (one during the first and third semesters, two during the second semester). Treatment and control groups were assigned randomly; however, students voluntarily entered in classes, so it was not possible to randomly assign students to control and treatment groups. Data was carefully analyzed to detect possible biases among the two groups. There were no statistically significant differences in students' characteristics between treatment and control groups. The study was conducted during Spring and Fall 2010 and Spring 2011. Treatment and control group sections were taught by the same instructor. The study was conducted at a Public University in the Midwest. The University primarily serves an undergraduate population from the local and regional community. Diversity noted in University classrooms is due to a strong foreign exchange program.

DATA

The original sample included 271 students; however, many of these students did not have ACT scores available and were removed from the study sample. The final sample used for the study consisted of 168 students. Of the remaining students in the sample, 51% were male, 44% were majors in Business or Economics, and 40% of the students were juniors. The grade point average (GPA) prior to enrollment in this course was 2.99. The average comprehensive ACT (American College Testing) score of those enrolled in the study was 22.79. Students in this class completed 91% of their homework assignments and the students' average age was 21.64 years. On average students had already taken three[1] Business or Economics classes before taking the Principles of Macroeconomics class and were enrolled in 15 credits while participating in this class. The descriptive statistics can be found in Table 1.

Table 1: Descriptive Statistics

Variable	Description	Mean	Std. Dev.	Min	Max
Exam1	Percentage questions correct on Exam 1	79.11	10.03	48	100
Exam2	Percentage questions correct on Exam 2	80.88	11.41	45	100
Exam3	Percentage questions correct on Exam 3	67.19	14.22	29	97
AvgExam	Average of percentage questions correct	75.72	9.06	50	97

Table 1: Descriptive Statistics					
Variable	Description	Mean	Std. Dev.	Min	Max
Reflection	Reflective Writing Section =1	0.48	0.50	0	1
Actcomp	ACT comprehensive Score	22.79	2.95	15	31
GPA	Prior term cumulative GPA	2.99	0.57	0.6	4
Age	Average age of students	21.64	1.49	20	29
Credits	Credits currently enrolled in[1]	15	1.77	9	20
Priorclass	Prior class in Business or Economics[2]	3	2.93	0	17
Hwcomp	Percentage of homework asgn. completed	0.91	0.11	0.375	1
Gender	Gender: Male =1	0.51	0.50	0	1
Slevel	Level of Studies, Freshman=1, Sophomore=2,…	2.92	0.86	1	4
BusEcon	Majors in Business and/or Economics = 1	0.44	0.50	0	1

EVALUATING THE INFLUENCE OF REFLECTIVE WRITING ON EXAM PERFORMANCE

The researchers were interested in determining if reflective writing improved student performance on objective content examinations. An educational production function following Hanushek (1979) was applied for testing the impact reflection papers made on examination performance. The education production function suggests student performance, as measured by course grades, is affected by background (gender, university class, and age), motivation (homework completion, major, credits) and ability (GPA, ACT). Following Hanushek's approach we estimated the following function:

Percentage exam questions correct = f(background, motivation, ability, reflective writing)

We expect the general ability level of students (GPA and ACT) is positively correlated with performance as noted by examination scores. The background variables are supposed to control for student specific characteristics. The economic education literature generally finds female students do not perform as well in economics classes as male students (Ballard and Johnson, 2005; Walstad and Robson, 1997). Thus, we expect the sign on our gender variable to be positive (gender dummy male=1). Furthermore, it is possible students develop better study and test taking strategies as they get older and have taken more classes. We would expect the signs of the age coefficient and the university class coefficient to be positive. On the other hand, it might also be possible there are students not interested in the class that are required to take it for their major/minor. Additionally, students may participate in the class at a later stage (junior/senior year) of their university career. Potential lack of interest might cause the coefficient to be negative. Hence, we might have two opposing influences, ultimately causing the coefficient to be insignificant altogether.

Furthermore, we expect homework completion scores are positively correlated with examination scores. This effect might either result from a practice effect or simply identify students who are more engaged and interested in course content. We might also identify individuals completing more homework perform better on course examinations. It would be expected students majoring in business or economics would exercise more effort in these classes,

as the class is required for their major-thus affecting in-major GPA. Influence of major on exam scores might also be caused by simple selection. Students knowing their academic performance will likely be strong in these classes might actually chose taking them, leading to a positive coefficient on the major variable. Furthermore, the credit load students take during any given semester can influence exam scores in both directions; good students might take more classes than bad students, because the good students might actually need less time for class preparation, leading to a positive correlation between exam scores and credits. It is also possible taking high numbers of credits give students less time to spend studying per class leading to a negative correlation between exam scores and credits. Finally, we also include the number of classes a student has taken in Business and/or Economics prior to taking Principles of Macroeconomics. Most of the classes students have taken before enrolling in Principles of Macroeconomics are Business or Accounting classes, thus it is not clear how well those classes would prepare a student for a class in Principles of Macroeconomics. It is possible students become familiar with the type of conceptual arguments made in Business and Economics by taking these classes, and are more prepared for them. Thus, we expect that the number of previous classes taken in Business and/or Economics will positively influence exam performance in Principles of Macroeconomics. All of these results can be found in Table 2.

In a second set of regressions (Table 3) we separated the students by the median of their exam scores to further estimate the impact of the reflective writing assignments on students' examination performance.

Results of the OLS regression (Table 2) show students with higher comprehensive ACT scores were positively correlated with examination performance. The ACT variable was 95% significant in the regression using the average exam scores as the dependent variable. It was further noted for each individual examination regression results were 95% significant for exam 1, 90% significant for exam 2, and 99% significant for exam 3. As expected, the GPA in the semester before participating in the course had a strong positive correlation with examination performance during study analysis. The GPA variable was at least 90% significant in all basic regressions (Table 2). In addition, as data in Table 2 illustrate, the more credits a student was enrolled in during the study, the worse the student performed on the first examination. Credit load (Credit) and student performance was correlated. For each additional credit taken, examination scores dropped by 0.86%, and average examination scores lowered by 0.59% for each additional credit hour taken. This confirmed the study hypothesis taking more credit hours reduced the amount of time students spent preparing for class, resulting in poorer academic performance on examinations. The credits variable is 90% significant and negative in the regression including the average exams scores of students and 95% significant in the regression including only the results from the first exam. Furthermore, in deference to what the scientific literature indicates, female students did not have lower exam scores than their male peers (Gender). In fact, we found with 95% significance male students had 1.95% lower scores on the first examination. Students majoring in Business or Economics also had better exam scores

(BusEcon). However, we only found a positive effect at the 95% level of significance for performance on the first exam. Students majoring in Business and/or Economics scored 2.95% higher on the first exam compared to their peers. The choice of major was not a significant indicator for exam performance for the other exams. Study results also found the number of classes taken in Business and Economics prior to taking Principles of Macroeconomics did positively influence average examination performance (priorclass). The coefficient is significant at the 90% level in the regression where average exam scores are the dependent variable. Each additional class taken increased the average exam score by 0.3%. However, prior classes taken did not significantly impact any of the regressions using separate exam performances as the dependent variable. Contrary to the study hypothesis, homework completion scores (hwcomp), age, nor grade level (slevel) had any significant impact on examination performance.

One key result to note includes students enrolled in the treatment sections did not have higher examination scores than students in the control groups[2]. It should be noted for the purposes of this study students only wrote three reflective papers during the course of the semester. Even though study results determined reflective writing did not statistically impact examination performance, insufficient number of reflective writing assignments could have contributed to these results

It is also possible high performing students already have learning techniques and study strategies for succeeding academically in place, and their performance was not benefitted by the pedagogical technique of reflective writing. Splitting the sample of students at the median examination score[4] gives us a possibility to test this hypothesis. Results for these regressions can be found in Table 3.

Splitting the sample by the median of the percentage of correct answers for each exam provided further insights into the effectiveness of the reflective writing assignments. Students in the treatment group having scores below or equal to the median benefited from incorporating reflective writing assignments into the course. These students answered 3.5% more questions correctly than the students in the control group (Table 3 Column 7). Data demonstrates an impact only on the third examinations score for these individuals. It is possible it took several weeks for the benefits of the writing assignments to be empirically observed on objective testing. Results are offered in Table 3. Overall, the study documented reflective writing assignments had merit as an active learning tool, especially when the instructor is concerned with the performance of students at the lower end of the performance spectrum.

Table 2: OLS Regression

	(1)	(2)	(3)	(4)
Dependent Variable	Average of Percentage Exam Scores	Percentage of correct answers - Exam 1	Percentage of correct answers - Exam 2	Percentage of correct answers - Exam 3
Reflection	0.537	-1.379	1.186	1.804
	(1.226)	(1.056)	(1.372)	(2.034)
Actcomp	1.035**	1.118**	0.781*	1.204***

Table 2: OLS Regression				
	(1)	(2)	(3)	(4)
Dependent Variable	Average of Percentage Exam Scores	Percentage of correct answers - Exam 1	Percentage of correct answers - Exam 2	Percentage of correct answers - Exam 3
	(0.308)	(0.412)	(0.337)	(0.297)
Credits	-0.591*	-0.864**	-0.061	-0.850
	(0.258)	(0.249)	(0.634)	(0.637)
GPA	7.210***	4.146*	7.445***	10.039***
	(1.240)	(2.136)	(1.740)	(2.120)
Priorclass	0.337*	0.162	0.323	0.528
	(0.145)	(0.297)	(0.269)	(0.328)
Gender	-1.462	-1.930**	-1.150	-1.306
	(1.190)	(0.624)	(2.206)	(1.401)
Slevel	0.359	0.275	0.011	0.793
	(0.814)	(0.631)	(0.990)	(1.474)
BusEcon	1.776	2.950**	0.910	1.468
	(1.224)	(1.035)	(2.057)	(1.898)
Age	0.252	0.562	0.150	0.045
	(0.428)	(0.472)	(0.501)	(0.494)
HWcomp	-5.517	-2.546	-14.454	0.449
	(7.334)	(5.924)	(8.907)	(11.644)
Constant	36.603	43.375	-14.454	16.282
	(11.078)	(14.006)	(8.907)	(17.328)
R^2	0.372	0.218	0.212	0.273
N	168	168	168	168
Data source: Author's university; Statistical significance is indicated as follows: * p<0.10, ** p<0.05, *** p<0.01; Standard errors are reported in parenthesis; OLS regression with standard errors clustered by classes[5]				

In general with regards to the control variables, the results for the split sample (Table 3) matched the results of the full sample (Table 2). ACT scores and GPA scores are still positively corrected with exam performance. The evidence on the influence of credits enrolled on exam performance appears to be less in the split sample regression. The variable is only significant at the 90% level for the group of students scoring below the median (Table 3 column 1).

Table 3: OLS Regression with Split Sample								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Average of Percentage Exam Scores		Percentage of correct answers - Exam 1		Percentage of correct answers - Exam 2		Percentage of correct answers - Exam 3	
Sample splitting rule	<=	>	<=	>	<=	>	<=	>
	Median of dependent variable		Median of dependent variable		Median of dependent variable		Median of dependent variable	
Reflection	1.810	-0.667	-0.032	-0.468	1.216	-0.221	3.489***	-1.694
	(1.684)	(0.728)	(1.670)	(0.851)	(2.388)	(0.745)	(0.863)	(0.967)
Actcomp	0.663*	0.346	0.577	0.470*	0.964**	-0.002	0.720*	0.356
	(0.289)	(0.230)	(0.379)	(0.218)	(0.391)	(0.046)	(0.333)	(0.322)
Credits	-1.185*	-0.104	-0.825	-0.317	-0.582	-0.016	-1.123	-0.661

Table 3: OLS Regression with Split Sample								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Average of Percentage Exam Scores		Percentage of correct answers - Exam 1		Percentage of correct answers - Exam 2		Percentage of correct answers - Exam 3	
Sample splitting rule	<=	>	<=	>	<=	>	<=	>
	Median of dependent variable		Median of dependent variable		Median of dependent variable		Median of dependent variable	
	(0.502)	(0.137)	(0.545)	(0.197)	(0.929)	(0.132)	(0.586)	(0.386)
GPA	2.787**	3.889***	3.898**	2.363*	2.173	2.183	3.753*	5.145**
	(1.133)	(0.789)	(1.342)	(1.097)	(2.049)	(1.228)	(1.536)	(1.675)
Priorclass	0.148	0.311**	0.037	0.256**	0.682	0.234	0.288	0.064
	(0.331)	(0.114)	(0.276)	(0.083)	(0.488)	(0.177)	(0.416)	(0.227)
Gender	-0.931	-0.102	1.066	-1.652*	-2.719	0.940	-5.436	0.082
	(1.688)	(0.716)	(1.595)	(0.802)	(2.632)	(0.649)	(2.828)	(0.616)
Slevel	0.376	0.066	-0.070	1.022*	0.317	0.351	-0.249	-1.082*
	(0.836)	(0.444)	(0.746)	(0.469)	(1.048)	(0.334)	(1.158)	(0.530)
BusEcon	0.209	0.629	2.865*	1.126	-1.495	0.674	0.286	0.293
	(0.855)	(1.079)	(1.276)	(1.056)	(2.463)	(0.870)	(1.489)	(2.107)
Age	0.205	0.337	-0.019	-0.345	-0.402	-0.167	-0.468	0.364
	(0.430)	(0.327)	(0.712)	(0.535)	(0.416)	(0.383)	(0.339)	(0.331)
HWcomp	-5.732	-4.077	-2.652	-15.59**	-10.200	-3.671	2.837	-7.533
	(5.449)	(3.554)	(5.361)	(5.609)	(13.334)	(2.954)	(8.607)	(5.463)
Constant	-341.548	-603.698	98.809	772.624	862.688	416.750	975.068	-649.103
	(853.89)	(647.33)	(1417.7)	(1061.3)	(819.93)	(760.32)	(679.02)	(657.47)
R^2	0.231	0.236	0.206	0.399	0.151	0.154	0.240	0.219
N	78	90	101	67	96	72	89	79
Data source: Author's university; Statistical significance is indicated as follows: * p<0.10, ** p<0.05, *** p<0.01; Standard errors are reported in parenthesis; OLS regression with standard errors clustered by classes								

The number of classes taken previously still appears as a significant influence on exam scores. However, only students who are above the median exam scores for the first exam and the average exam scores benefitted from having taken prior classes in Business and/or Economics. The coefficient (priorclass) is significant at the 95% level for these two groups. Each additional class raised their exam scores by 0.31% (average exam scores Table 3 column 2), or respectively 0.256% (Table 3 column 4). Different to the results for the full sample, we found the class level (slevel) was 90% significant in two cases. However, data points in opposite directions in each case. Having advanced one level (e.g. Junior to Senior) increased the exam performance by 1% for students above the median for the first exam. It was also found having advanced one level decreased the exam performance by 1% for students above the median for the third exam. The positive effect for the first exam could be caused by advanced study skills and strategies students develop in school (Table 3 column 4). The negative effect on the third exam however, could be caused by students being familiar with final exams and being over confident and thus not preparing as carefully as students at a lower level of studies (Table 3 column 8). Another supposition is lack of time management as the semester comes to a close, resulting in inadequate study and test taking preparation. The results for Business and/or Economics majors were

partially confirmed. However, the positive significant effect of the major on exam performance is restricted not just to the first exam, but to only the group of students below the median exam scores. This group had 2.9% higher exam scores on the first exam (Table 3 column 3). Lastly, we identified completing more homework assignments had a negative and significant impact on exam performance for students above the median on the first exam (Table 3 column 4). However, it is likely the result is affected by the course policy dropping the lowest three homework scores from the calculation of the final overall course grade. Thus, it is likely that students who already had high average scores, chose to skip certain assignments, explaining the negative relationship between homework completion percentages and examination performance.

CONCLUSIONS AND FUTURE RECOMMENDATIONS

In conclusion, the researchers believe writing reflection papers influenced students' examination performance even though mixed statistical results were found. A statistically significant influence of reflection papers was limited to the students below the median examination score performance. These individuals had higher examination scores during the third exam. This is an important result that allows instructors to specifically target struggling students. Reflective writing helps the weaker students to take charge of the material and relate it to their own lives. Thus, by using reflective writing assignments we not only help these students to achieve more success on exams, but also give these students the tools to apply economic concepts in their lives after school. In addition, as we have shown, this positive outcome can be realized with a rather limited number of extra assignments. The positive impact of reflective writing on the exam performance in our study was limited to the third and final exam of the semester, thus we can conclude that three is the minimum number of reflective writing assignments to gain a measureable impact on student performance. Incorporating reflective writing into the curriculum also benefits the students in other ways. After an instructor grades and evaluates the reflective writing papers, the instructor is equipped with examples that are more closely related to the lives of the students. These examples can then be included in future classes and improve the learning of future students.

Finally, because we were unable to find a positive impact of the reflective writing assignments on exam scores for students above the median, it is also possible that quantitative assessment through final examination scores does not accurately reflect improvements in retention of knowledge and application of concepts gained in "Principles of Macroeconomics" classes. An improvement may only be measureable by performance in the workforce long after graduation, and a study of quantitative and qualitative impacts of student performance in the workforce following graduation can be conducted. Furthermore, more research is recommended for considering modifying course assessment schema and finding a balance between writing enough papers for generating positive quantitative effects on students' examination performance and the time constraints faced by instructors while employing reflective journaling as a method

for teaching and learning in the classroom. A future study should separate students in three different groups: a group that does not write any reflection papers, a group that writes three reflection papers and a group that write more than three reflection papers. This setup would allow research to gain more insight into the effectiveness of the exercise. Furthermore, the quality of the reflection papers could be used as another determining variable for the exam performance of students. Finally, assigning specific topics for reflection and then testing the comprehension of exactly these topics could lead to more measurable results, instead of allowing the students to choose from a range of topics.

ENDNOTES

1 Rounded to a meaningful whole number

2 Most commonly, students had already taken Introduction to Accounting, Principles of Microeconomics, and Principles of Marketing

3 Controlling for reflection paper grades or the number of students who actually turned in their reflective writing assignments did not influence the results.

4 Splitting the sample at the median GPA or median ACT scores did not provide any further insights

5 The authors tested for interaction effects of all independent variables with the reflection dummy, no results were found; the authors also used SUR for all three exams and did not find any further results beyond the basic OLS regression.

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APPENDIX

Reflection Papers Guideline for Students:

The guidelines provided to the students participating in the Macroeconomics class are provided here. Students (You) are required to write three reflection papers during the semester. Each reflection paper is due the day after the review sessions for the exam. The papers should be 150-300 words long explaining how one of more of the just-completed textbook chapters relates to your life. There are no wrong answers, but a summary of the chapter is not acceptable. You are expected to reflect on the material from the chapter and determine the way(s) in which it is meaningful to you either for the past, present, or future. Your evaluation is based on the originality and insightfulness of your work and not the quantity. The reflection papers need to be submitted into the appropriate dropbox on D2L (submit a .doc or .docx file that includes your name and class section in the header – files that do not follow the rules will not be graded). The purpose of the reflection papers is getting you used to applying the language of economics, to creatively express your understanding of economic principles while developing written communication and higher-level critical thinking skills. Please, use an appropriate amount of time to finish the reflection papers (format for reflection papers derived from Brewer and Jozefowic, 2006).

Grading

Three forms of grades were given for the reflection papers: good performance - appropriate example together with correct use of economic terminology; average performance - just providing example without relating it to economics topic; poor performance - incorrect use of economic terms and not inappropriate example.

ASCERTAINING THE EFFICIENT FRONTIER IN THE CLASSROOM

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ABSTRACT

This paper presents a tutorial on how to use the Solver function of Microsoft Excel to teach students in an investments class how to implement much of the theory that is associated with Modern Portfolio Theory. With this tutorial the instructor is shown how to develop the efficient frontier of investments for the class, find the specific asset weightings that produces a target rate of return with the least possible risk, and how to introduce additional constraints into the analysis.

Keywords: *Modern Portfolio Theory, Efficient Frontier, Beta*

INTRODUCTION

One common objective of investments courses is introducing students to the many aspects of Modern Portfolio Theory (MPT). Within MPT students are taught about the efficient frontier of portfolios made up of the set of efficient portfolios. These efficient portfolios are important to the investor because they offer the least amount of risk at each possible rate of return and the best return possible for each level of risk. Any other portfolio will be characterized by higher levels of risk than are necessary to produce any given rate of return.

Most university investments courses deal with MPT—and particularly the efficient frontier—from a theoretical stand point. Unfortunately some students have difficulty following the theoretical discussions and so they cannot fully grasp the powerful practical implications found in MPT. Also there are some students who do understand the theory, but have difficulty making the transition to a practical application in the construction of an actual portfolio. Most textbooks fail to address these instructional problems.

In this study we present a tutorial on how to use a special function in Microsoft Excel to teach students about MPT. Following the approach presented in this tutorial, the instructor can start with a given set of assets and find the efficient (minimum risk) portfolio for a given rate of return. Students can be asked to find efficient portfolios as well because of the ubiquitous nature of Excel. Once the basic portfolio is developed, the results can be modified to present additional constraints on the portfolio to prevent one particular asset from being too heavily weighted.

SETTING THE EXAMPLE

For simplicity in this tutorial, you are only given five assets to build your portfolio. As such your analysis will ascertain the best portfolio available to the investor given the small set of investment possibilities. However, you will recall that in his analysis Markowitz (1952, 1959) assumed a data set made up of *all* of the risky assets in the world. While it is a little unrealistic to assume you could actually assemble that data set for an analysis, it is true that the larger your data set the more options are open to you for building a great portfolio. So the odds are that the larger the data set then the better will be the portfolio ultimately derived from your analysis. If one can perform this analysis for the investor with a five asset data set, then the analysis with a 50 or 500 asset database is the same.

Markowitz originally presented his theory using standard deviation as the risk measure, and he sought to minimize the constrained non-linear equation for the standard deviation of the portfolio to arrive at efficient portfolios. Later research by Sharpe (1964) simplified the modern investor's work as he introduced beta as the measure of systemic risk in a portfolio. Sharpe's discovery of beta allows the investor to minimize the linear equation for the beta of the portfolio, which many more computer software resources can accommodate.

Given below is the initial set of assets with which you will work. Asset B can be thought of as a broad market mutual fund, with the same risk and return as the overall market. The other assets may be other funds or individual investments.

Table 1: Data Set

	Asset A	**Asset B**	**Asset C**	**Asset D**	**Asset E**
Beta	1.2	1	0.8	0.6	0.4
Expected Return	11%	10%	8%	7%	6%

The portfolio that you recommend to the investor will be made up of from one to five of these assets. The final portfolio will consist of a certain percentage or weighting of each of these assets, with a weight of zero indicating that the asset is not included in the portfolio. You must solve for the percentages or weights providing the lowest beta and still producing the required rate of return. At the moment these weights are not known. However, this problem can be stated as a linear programming problem and very easily solved in Excel.

The basic statement of the problem is:

Minimize beta

Subject to:

Total return of the portfolio must be at least the specified amount

The sum of the weights must equal 1.

If w_1 = weight of Asset A, w_2 = weight of Asset B, w_3 = weight of Asset C, w_4 = weight of Asset D, w_5 = weight of Asset E, this example problem is stated as

$$\text{Minimize beta} = 1.2w_1 + 1w_2 + 0.8w_3 + 0.6w_4 + 0.4w_5$$

Subject to:

$0.11w_1 + 010w_2 + 0.08w_3 + 0.07w_4 + 0.06w_5 \geq$ required rate of return

$w_1 + w_2 + w_3 + w_4 + w_5 = 1$

All weights must be non-negative

Once the rate of return is chosen, this problem can then be entered into Excel and easily solved.

CONSTRUCTING THE SPREADSHEET

To begin, set up your spreadsheet as shown in Table 2. Cells B1:F1 are where your answers (weights) will appear, cells G4:G6 will hold formulas to calculate the total beta (G4), the total return (G5), and the total of the weights (G6), and the cells B4:F6 and I5:I6 are for input values from the objective and the constraints listed above. In cell G4 enter this *exact* formula: =SUMPRODUCT($B$1:$F$1,B4:F4) to calculate the total beta. This multiplies the weights in row 1 by the betas in row 4 and adds them together. Copy the formula in G4 into cells G5 (total return) and G6 (total of the weights). It is helpful to put a 1 in cells B1:F1 at this point to check your formulae, although this is not shown in Table 2.

Table 2: Excel Spreadsheet for Minimizing Beta

	A	B	C	D	E	F	G	H	I
1	Solution (weights)								
2									
3	Asset	A	B	C	D	E	Total		Limits
4	Beta	1.2	1.0	0.8	0.6	0.4			
5	Return	0.11	0.10	0.08	0.07	0.06		>=	.06
6	Weights sum to 1	1	1	1	1	1		=	1.000

Examine what you have so far by looking at each row separately.

1. Row 1 is where the solution (i.e., the weightings of each asset) will appear. .
2. Row 2 is simply blank space to set off the solution you will find.
3. Row 3 names the five assets in the data set placed within columns. Information about each asset will be placed in its column in the subsequent rows.
4. Row 4 reports the beta of each asset.

5. Row 5 shows the expected return of each asset in Columns B through F. In Row 5, Column H you see a mathematical sign (for reference only) and in Column I you see the value .06 indicating you want a return equal to at least six percent from these assets. (The reason the ">" is included is that if a return of six percent is not feasible, you want the closest possible return greater than six percent.)
6. Row 6 indicates that weights in the final portfolio must sum to "1."

ADDING/ACTIVATING SOLVER

To find the solution, you will use Solver which is an add-in that comes with Excel. At the top of the Excel worksheet, click on the "Data" tab. Look for "Solver" on the Ribbon at the top of the worksheet. If you do not see it, you must activate it. If you do see Solver on the Data tab, then you can skip the next set of steps where adding/activating Solver is described.

To activate Solver:

1. In Excel 2010, go to the upper left corner of your Excel page and click the File tab. In Excel 2007, click on the round (and multi-color) Microsoft Office button
2. Click on "Excel Options" and then click on "Add-Ins."
3. At the bottom of the window, locate the "Manage" dialog box and select "Excel Add-Ins" from the list. Click "Go."
4. Check the box for the Solver Add-in and click "OK." You should see Solver on the Data Tab in the Excel Ribbon. (Be patient if the installation takes a few minutes.)

THE EFFICIENT FRONTIER

Now that you have Solver on the Data tab, you can use it to find the efficient frontier. In this section of the paper we will find several points on an efficient frontier generated from the data set given above. In this analysis we shall use beta as the risk measure of the assets in the data set and the portfolio.

To find the efficient frontier, solve for the efficient portfolios that would have required returns of six, seven, eight, nine, ten and 11 percent, respectively. These must be solved for individually. First we shall solve for the portfolio that produces the six percent return, and then move on to the other required portfolio returns. Do the following:

1. Click on Solver. A window labeled "Solver Parameters" now pops up.
2. For Excel 2010 only: check the box for "Make Unconstrained Variables Non-Negative," and choose Simplex LP in the window for "Select a Solving Method."

3. For Excel 2007 only: click "Options." When the window for "Solver Options" opens, check the boxes marked "Assume Linear Model" and "Assume Non-Negative." Now click on "OK" and you return to the previous dialog box.
4. The cell that contains the value (total beta) to be minimized is called the Objective in Excel 2010 and the Target Cell in Excel 2007. Type G4 into this Objective or Target Cell box (or click this box to highlight it and then click on cell G4).
5. Click the button that says "Min" to specify that the Objective/Target Cell is to be minimized
6. Click on the box "By Changing Variable Cells" (the word "Variable is omitted in Excel 2007) and select cells B1 through F1. This is where the final weightings of the assets will appear. The Objective/Target Cell is to be minimized by changing the values in these cells (which contain the weights).
7. Click on "Add" and then designate cell G5 (total return), then select ">=," then select cell I5. This tells the program the portfolio return (G5) must be equal to or greater than 6.00 percent (I5).
8. Click "Add" again and select cell G6, click on "=," then select cell I6. That constraint tells the program that the sum of the weights (G6) must equal one (I6).
9. Click on "Solve" and optimum asset weights appear in cells B1 through F1.

The portfolio that was just found is a single point on the efficient frontier and is the portfolio that produces the six percent rate of return. This portfolio is described on the first row of the following table. The portfolio is entirely made up of Asset E, which is the asset with a six percent rate of return. Other points on the frontier may be found using the process just described, but substituting in other possible returns into cell I5 at the start of the search for each new portfolio. The results will be:

Table 3: Efficient Frontier

Required return	Beta	Asset A	Asset B	Asset C	Asset D	Asset E
.06	0.40	0%	0%	0%	0%	100%
.07	0.55	0%	25%	0%	0%	75%
.08	0.70	0%	50%	0%	0%	50%
.09	0.85	0%	75%	0%	0%	25%
.10	1.00	0%	100%	0%	0%	0%
.11	1.20	100%	0%	0%	0%	0%

What has been developed here is the efficient frontier. Each portfolio is efficient in that no other portfolio can be constructed from this data set that produces the same returns and does

so with lower beta measures of risk. For example the minimum risk portfolio that produces an eight percent return does so with a beta of 0.70 and equal weightings of Assets B and E in the portfolio. The other three assets are omitted from the efficient portfolio. It is not possible to construct a portfolio from this set of assets that produces an eight percent return and does so with less risk (i.e., a smaller beta) than this portfolio.

THE TARGET PORTFOLIO

Now that the efficient frontier has been derived, let's help the investor find his target portfolio. Assume that the investor is constrained to this set of assets, and the investor wants the minimum risk portfolio that would produce a portfolio return of 8.74 percent. First change the value in cell I5 to read "0.0874" so that you can solve for the efficient portfolio that will produce that return. Then activate Solver and solve for the solution. Below is the solution you should find in cells B1:F1.

Table 4:Weights of Assets in Target Portfolio

Asset A	Asset B	Asset C	Asset D	Asset E
0%	68.5%	0%	0%	31.5%

The investor's optimum (minimum risk) portfolio is made up of only assets B and E, weighted with 68.5 percent of funds in Asset B and the remaining 31.5 percent of funds placed into Asset E. This target portfolio solution provides you a final portfolio beta of **0.8110**. You cannot put together another portfolio with these five assets that will give you a return of 8.74 percent with a smaller beta (i.e., less risk). Have your students try and see if they can prove the solution wrong.

THE CONSTRAINED TARGET PORTFOLIO

Now take this analysis one step further. Assume that you are not happy advising the investor to put more than 2/3 of the money into one asset. What can you do? The answer is that you can limit the maximum weighting of any asset in the final portfolio. Suppose you wish to limit the weight of any single asset to no more than 35 percent of the total portfolio. You can limit the weight of each asset by adding additional constraints. For example, $w_1 \leq 0.35$ would limit the weight for Asset A., and constraints on the weights for the other assets would be formulated in a similar fashion. The Excel worksheet would be modified as follows:

1. Put "1" in cells B7, C8, D9, E10, and F11, as shown in Table 5 for each of the five new rows.
2. Put "0.35" in each of the cells I7 through I11.
3. Copy cell G4 into cells G5 through G11.

4. Click on the Solver button again. Note that the original problem is still there.
5. When the dialog box opens, add a new constraint by clicking on "Add."
6. Designate in the proper spaces the cell reference of "G7:G11." You can just click G7 and drag the cursor to G11.
7. Select the "<=" sign.
8. To the right of the "<=" sign, enter "I7:I11".
9. Click OK.
10. Click Solve.

Table 5: Excel Spreadsheet with Limits on Weights

	A	B	C	D	E	F	G	H	I
1	**Solution (weights)**								
2									
3	**Asset**	A	B	C	D	E	Total		Limits
4	**Beta**	1.2	1.0	0.8	0.6	0.4			
5	**Return**	0.11	0.10	0.08	0.07	0.06		>=	0.0874
6	**Weights sum to 1**	1	1	1	1	1		=	1.000
7	**weight for A**	1	0	0	0	0		<=	0.35
8	**weight for B**	0	1	0	0	0		<=	0.35
9	**weight for C**	0	0	1	0	0		<=	0.35
10	**weight for D**	0	0	0	1	0		<=	0.35
11	**weight for E**	0	0	0	0	1		<=	0.35

The revised solution uses four of the five assets, and still produces an expected return of 8.74 percent. The beta of this new optimum portfolio is **0.8260**. The beta is slightly larger because your limitation of the weight of each asset and their constraints in Excel caused the previous solution to be unusable. Notice that Asset B comprises only 35% of the portfolio instead of 68.5% as before in Table 4.

TABLE 6: REVISED TARGET PORTFOLIO

Asset A	Asset B	Asset C	Asset D	Asset E
26%	35%	0%	4%	35%

Given the *very* marginal difference in the betas of these two portfolios, you can certainly argue that the investor is probably better off with this second (more diversified) portfolio.

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LEARNING BY DOING MODELS TO TEACH UNDERGRADUATE ECONOMICS

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ABSTRACT

There has been a lot of academic research about various teaching methods for economics courses. Rather than using traditional chalk and talk methods as a pedagogical tool, that have become less and less popular with students, academic research has started to focus on innovative teaching methods that could lead to more engaged students. Economics courses are also burdened with a reputation of being dry, boring, and too abstract with little real life applications etc. In this paper I describe an easy new tool that can be applied to make economics courses more interesting especially in business schools, as well as make it more application oriented. I describe a comprehensive project based learning approach for an introductory economics course and an international economics course, briefly review the course content and learning objectives and also provide some student feedback about the new technique used.
Keywords: Active Learning, Project Based Learning, Learning Outcomes, Teaching Economics in Business Schools.

INTRODUCTION

There has been a multitude of new thinking and research about various innovative teaching methods that can be used for economics courses both for undergraduates and for graduate MBA courses (see Becker and Watts (2005) and Becker, Watts and Becker (2006)). The traditional chalk and talk methods as a pedagogical tool in all subjects have become less and less popular as students become more and more demanding about teaching methods that are more in tune with the 21st century technological revolution. With a traditional "chalk and talk" pedagogical style, students tend to be less interested in the happenings of the classroom and more likely to let their minds wander. With the advent of smartphones and the use of laptops in the classrooms, students have every opportunity to tune out their professor and hop onto the internet where they can easily peruse the happenings of the day, catch up with their friends on Facebook, Twitter and other social media or could just carry on a text message conversation with their friends, some of whom might be sitting in the same classroom. In addition to this being problems for all courses, economics courses have the rather unsavory reputation of being dry, boring, impossible to understand, too math and graph oriented, too abstract with little real life applications etc. The last comment is especially galling as the principle ideas of economics have everything to do with business, and it is really not too difficult to come up with hundreds of

examples of applications of each economic concept. If you open the pages of any Business news website or periodical you will find a lot of events happening right then that demonstrate some application of an economic concept.

To counter this reputation it is important for economics instructors to make the subject appealing to students. While it is true that economics is a complex subject and teaching it to students, especially undergraduates, can be especially challenging, instructors have to teach students the subject in such a manner that they find interesting, relevant and able to be applied to real life situations. In this paper we suggest an alternate teaching tool to "chalk and talk" – learning by doing. This can be especially relevant where economics is taught in the business program and is an integral part of the business administration degree. The student is asked to be the owner of a hypothetical firm, and as the course progresses, the students have to analyze the effects of economic data and changing economic variables on the bottom line of their business. In this paper I describe the use of this teaching tool in a Principles of Microeconomics course and an International Economics course, and I use examples from the course material to illustrate the student learning goals. This project based learning method has been used twice (including the current semester) in an International Economics course, but in this paper I also provide a brief guide to using the method in a Principles of Microeconomics course. I also provide a brief survey about student perceptions about the pedagogical method being used here, and provide examples of similar techniques that can be used in other economics courses as well as economics courses that are taught in a non business school setting.

TEACHING ECONOMICS IN BUSINESS SCHOOLS

Economics as a course in Business Schools typically offers the exact same curriculum as in a Liberal Arts setting. The textbooks and all the support materials and test banks are essentially the same. However, students taking Economics courses as a Business Administration Major Core requirement or an Economics (or Business Economics) major within the Business School are exposed to a variety of other business disciplines like Management, Marketing, Finance, Accounting and Business Law. The pedagogy for all these different types of courses are naturally different but a closer look at some of the common teaching tools that are applied in these courses would indicate that they all use some kind of practical application that the students have to do themselves – get their hands dirty doing it, if you will. For example in a typical Finance course (the subject that is closest to Economics) a student could be participating in a stock market or futures and options game competing against other students, or use an excel spreadsheet to compute the finances of a company based on certain parameters. In a Marketing Course, a student would have to do a project based on the marketing strategy for a particular product or for a particular company. In a Management Course, the student may have to do a project on group activities and group dynamics, or making management decisions for a company or organization. In an Accounting Course students may be analyzing a real life case of an

accounting problem in a company, while in a Business Law and Ethics course, students may be analyzing an ethics or legal and regulatory issues case study. In all these examples, undergraduate business majors are getting a chance to try out their book knowledge in a real life or semi-real life situation. The benefits of this type of pedagogical approach are obvious: students get a reality based feel on how to apply their knowledge in a real life situation and it also enhances in the mind of the student the material that they have learned in class. Obviously if the material learned in class proves to be important when applied to a real world business, a student will have a significantly higher incentive to be interested in the material taught in class. Of late, students, especially business and other professional school students have been focused on courses and curricula that provide maximum applications to the professional world.

Traditionally though, education in economics is usually accomplished using a lecture or chalk and talk format (See Becker and Watts, 1996). There has been however the beginnings of a constructivist approach to education, even economics education in the last couple of decades. This can take the active learning form of being project based or experience based – what is called experiential learning. Rather than being a passive listener, a student is challenged to be an active respondent. The argument for such involved learning can be found in Senge (1990), and Borg and Stranahan (2002) where they argue that a student remembers only a fraction of what they hear but remember a majority of what they do. Thus a project based learning method, or a team based learning method, or a real life experience based learning method could lead to a better understanding and retention of the subject matter than a traditional lecture method. As described in Hawtrey (2007) an experiential learning methodology could be as simple as students bringing a news clipping that has some relevance to a topic that has been taught in class, or could be a more complex assignment e.g. students voting about two competing macroeconomic theories (Neoclassical and Keynesian interest rate determination) and justifying their vote with a one sentence argument. The instructor responds to every student's argument, and the class results are presented to the entire class. Since everyone participated in the simple give and take between the instructor and students, the students feel more engaged and prove to be better learners. One of the more popular experiential learning modules that have been used in an Economics course are conducting market experiments (or international trade experiments) in class, where students choose to be a buyer or seller (or importer or exporter) and interact with their fellow students as part of a market exchange process.

THE LEARNING BY DOING PEDAGOGICAL MODEL

The pedagogical tool that I am describing here is a project based learning experiment. This innovation has already been used by me in an International Economics course that is part of the International Business concentration in the BBA degree. In this paper I provide a description of the course plan and learning activities for the students in the abovementioned course and also

provide a guide to applying the same pedagogical tool in a Principle of Microeconomics course. As I comment on later, this pedagogical tool can be easily applied to a variety of other courses.

At my current institution, economics courses are offered only in the business school, and while there is no Economics major, this approach can easily be modified to suit the curriculum of any economics course in a business school setting and in a liberal arts major setting as well. Typically upper level economics major students are looking for employment in business settings, so this approach with any modifications that the instructor deems necessary should be beneficial to the students. The course International Economics is typically taken by a student in one of their final 2 semesters at the college and is offered once a year. The students have previously taken the two principles of economics courses (micro and macro) as well as the rest of the business core since this course is part of the elective courses for an International Business major. The project is an individual learning experiment, rather than a group project. There are two main reasons why I have chosen an individual rather than a group project. Firstly, a group project involves group dynamics that may not always be easy to manage – there are always individuals within groups that tend to free ride on other group members work, and since this was the first time that I was trying this new pedagogical tool, I decided against making group dynamics an issue in the project. Secondly the number of students in this course is always small – in previous semesters they have ranged between 10 and 15. Bunching students into groups would limit the total number of projects that the students completed and would thus lead to a lesser exposure of different countries, economies, businesses and cultures that students would discuss in class. However a group project could be feasible for a larger class section and for an instructor that is willing to deal with some of the group dynamics issues.

The Principles of Microeconomics course can also have a similar structure, except it might be easier to have group projects. Typically the introductory course tends to have a large number of students that are distributed from a variety of majors across any academic institution. Thus depending on the mix of students, the instructor can creatively design the project that students participate in. In the description below, I assume that the course is being taught in a business school to business and non-business majors.

The description of a project based learning pedagogical tool in an International Economics course is significantly more detailed than the description of a similar type of pedagogical tool that can be used in a Principles of Microeconomics class. The reason for this is that this innovation has been used in the international economics course and is currently on its second semester of use. The use in a principles course is just a guide to any instructor that is attracted to the idea of having students actively apply their class based knowledge to a quasi real world setting.

Course Plan and Learning Activities: International Economics

In typical International Economics course the main learning activities would be Home Work Assignments based on the chapters and topics covered in class, as well as a couple of exams. At the end of the course, students would have to submit a project/paper about a country to trade with, a product to trade in and a very brief description of the tariffs and exchange rates. As is usual of many undergraduate students, by the time the project comes around at the end of the semester, students would have pretty much forgotten almost all of the earlier topics covered in the course i.e. about comparative advantage, tariffs, exchange rates and exchange rate determination. Hence, a project covering applications of all of these topics at the end of the semester would just mean a cursory glance at these and building a very sketchy case for the country and product chosen to trade in, as well as just a brief description of the tariffs and exchange rates. Thus the whole idea of applying what they learn is completely lost, and the learning goals of the course would not be achieved by most students.

In the newly designed course, I attempt to make the student learning significantly more real life application oriented, and as suggested in "Senge (1990), and Borg and Stranahan (2002)", since students are actually applying their knowledge to a real life situation and are doing something on their own, rather than just listening to the instructor, they are more likely to retain the knowledge. While the project becomes the main focus of the course as a result of the changes, students are still tested on the material covered in class, through the use of online assignments. This is an addition to the course relative to the first iteration of the project based learning method. This change was based on student feedback, that I detail later, where the students were eager to test their knowledge of the materials in the text and the class lectures at least through an online assignment format. The recent prevalence and popularity of online course management systems like blackboard have thus opened up the possibility of using valuable class time to engage the students in more application oriented teaching and interactions. Students start out after the first class thinking about and formulating their project, they start to develop a United States based business that would import a product from another chosen country or export a product to another chosen country. As the course continues, the students complete several short papers and do presentations based on the papers. They submit assignments based on a description of the country chosen and its economic, geographical and political features, as well as a country risk analysis based on economic financial and political risk and a description of the cultural and social characteristics of the country and the effects of this on their business; a description of whether they are an importing or exporting business, as well as a justification of the product chosen for import or export applying the theory of comparative advantage; a description of the tariffs and other trade restriction for the product, or if there are trade treaties a description of them and so on. Students thus have a wonderful motivation – they are choosing their own country and their own product rather than either of those being handed out by the instructor. Thus a student who is environmentally conscious can choose to develop an

environment friendly product and choose to trade with a country that has a history of enacting environment friendly public policies. The papers and the presentations are a way for students to learn the practical applications of the topics covered in class. At the end of the class students submit a final project paper and present their project. The project is a cumulative sum of the papers done throughout the course with an underlying narrative running through it that the student has to make clear. The topics covered and the assignments are explained below. Each topic described below involves a written paper and an in class presentation on the topic. The final project and the presentation assignments are also shared briefly below.

The Global Economy

The course starts with the instructor providing a description of the global nature of business and a history of globalization, along with a brief description of performing a country risk analysis. Although students are expected to know about basic macroeconomic variables like GDP and Growth in GDP, Inflation and Unemployment by the time they enroll for this class, the topics are revised as part of the initial lectures. As part of the first assignment, students will learn to participate in the global economy. They will be the (hypothetical) owners of a firm that exports a product to a foreign country or imports a product from a foreign country. Students are free to choose their own country. However there were a few implicit constraints in their choice. Students were encouraged to choose countries that have a significant trading relationship at present with the United States. It was a constraint that students seemed to generally agree with, since choosing a country like Cuba or North Korea or certain African countries, with whom the United States has little or no trading relationships would defeat the purpose of actively applying the learning done in class to real life trading and international business situations. Also students were encouraged to choose countries that provide easy access to relevant economic data, as otherwise it would again defeat the purpose of the project. Once the students have chosen their country, they will research the economic, geographical and demographic statistics of the country they choose to do business with, and will also perform a country risk analysis that includes economic, financial and political risk. The assignments for this segment of the course are a 2 paged single spaced paper describing the country of choice and its geographical, political and economic characteristics, as well as a description of the country risk analysis. Students also present their findings to the class using appropriate presentation techniques i.e. power point slides.

Comparative Advantage and Resources

The second part of the course deals with the theory of comparative advantage: trade in products, specialization both complete and incomplete, as well as the role of resources and the Heckscher Ohlin theorem. Students will understand and research the products they should export

or import based on the theories of comparative advantage and abundant resources. Data on the US exports and imports to each country are researched from this official website of the US Census Bureau: http://censtats.census.gov/naic3_6/naics3_6.shtml . After researching the exports and imports of the United States with respect to the country of their choice, the students will decide whether they want to be an exporting firm or an importing firm, and also choose the product that they will export or import. They must justify the markets that they are going to sell their products in, based on the country they choose and the income of resources in that country. Students learn about the growth of the middle class in China and the dearth of appropriate white collar jobs for college educated youth, which could impact the distribution of income and thus the demand for certain types of products. Thus, standard trade theories can be applied in practice to provide students an opportunity to learn the theories by choosing the products to trade in.

Trade Policy

The third part of the course deals with the theory of tariffs, quotas and other restrictive trade policies and their impact on the products and prices as well as the welfare effects of such policies. Students will apply their knowledge of tariffs, quotas and other trade barriers and research actual tariffs and other trade policies of the countries and products that their firm will have to account for. For students importing a product into the United States they will research the tariffs and quotas using the Harmonized Tariff Schedule published by the United States Government. This is available at (among other sites): http://hts.usitc.gov. For students exporting a product from the United States to another country they will research those countries' tariffs using known sources on the internet, for example the following source of information published by the US Government: http://www.export.gov/logistics/eg_main_018142.asp. They will also learn about regional trading agreements like NAFTA, depending on the country they choose.

International Factor Movements

The fourth part of the course deals with labor and capital migration. Students learn about the effect of immigration as well as the effects of capital mobility across the world. Students will investigate labor and capital movements between the US and the rest of the world, and analyze the impact of the mobility of labor and capital on their business. Students also learn about multinational companies and outsourcing and the role of society and culture on business, with an example based on the operation of McDonalds in India and the differences in their product and service based on the cultural and religious characteristics of India.

Exchange Rates, Foreign Exchange Markets and Monetary Policy

In the last part of the course, students learn about exchange rates and calculations of exchange rates, as well as the effects of an appreciation or depreciation of a currency on the imports and exports of a country. Students will apply their textbook knowledge of exchange rates to provide the current exchange rates between the United States and the country they choose to do business with, and provide graphs and tables of exchange rate fluctuations in the near past. These are available at a multitude of business and foreign exchange websites, e.g.: http://www.oanda.com/convert/fxhistory. Students learn about spot and forward rates, exchange rate risk and the operation of hedging to minimize the risk. Students apply this knowledge by demonstrating a hedging example for their business. Students also learn about the role of monetary policy in exchange rate determination and inflation and foreign exchange markets to analyze the impact of changes in exchange rates on their exports and imports. They will be able to understand the differences between fixed and flexible exchange rate countries. They learn about an example from China and the role of the Chinese Central Bank in keeping the Chinese currency fixed against a basket of foreign currencies and the US dollar and the resulting effect on price levels in China. They also read about examples of increases in coffee prices in Columbia and the effect on the import of coffee to the United States as well as the impact of inflation in China on trade between the United States and China. Students will also study the domestic monetary policy of the countries that they are doing business with and be able to form expectations of exchange rates.

During the course of the semester students research and apply each of the above topics to their business and write short papers and present their findings. As a final project, students will be able to present their complete findings and analysis to the class. This research paper documents the students learning using their experience of participating in the semester project. Thus the final presentation and paper are not just a cut and paste version of the shorter papers and presentations that were done throughout the semester. Students have to provide a meaningful narrative for their final project and be able to relate the different aspects of international trade and finance.

Course Plan and Learning Activities: Principles Of Microeconomics

The logistics and strategy for pursuing a similar kind of pedagogical innovation in a Principles of Microeconomics course is somewhat different than in an International Economics course. This course is the introductory course in economics so it makes sense for instructors to follow their normal lecture patterns as well as the normal in class and homework assignments and the exams. Since it is one of the two introductory economics courses, it is important that students first learn the important concepts of economics and then attempt to apply these concepts to an application setting. Thus in this course, the project would be expected to be much smaller

in scope and constitute a much smaller proportion of the overall grading for the course. Keeping in mind the smaller scope of the project instructors can limit the number of topics that they use in the project. The instructor can choose from these topics as they may deem appropriate for their class. Once again students can form a hypothetical business (in a group or as individuals as the case may be), choose a product or service that they would like to produce and sell and be exposed to real world applications of the topics below.

Supply and Demand

After learning about the concepts of supply and demand as well as market equilibrium and the changes in equilibrium prices due to changes in supply and/or demand conditions, students can apply this learning to their business. Students do an expected market survey and try and predict supply and demand changes for their product based on past historical data. Once students figure out the expected changes, they can figure out the expected effect on their product and their business and try and formulate a strategy to enhance the position of their business based on the expected market changes.

Elasticity

For a business, this is one of the most important topics that are taught in a microeconomics class. After learning about the basic concept of elasticity and the differences between elastic and inelastic goods, students also learn the relationship between price of a product, revenues and elasticity and are able to apply these concepts to pricing of products. Once students learn these concepts, they can look at their business and the product they are selling and try and figure out if the product is elastic or inelastic in demand based on whether the product is a necessity or luxury, whether there are many substitutes, and also whether it is a relatively expensive or inexpensive product. They can also use this analysis to figure out appropriate strategies of price changes to increase revenues, and also figure out the pricing power that their business has over the consumers.

Productivity and Costs

Again this is a critically important topic in a principles of microeconomics class especially when related to businesses. Students learn about the concepts of marginal product and average product as well as fixed and variable costs and marginal costs. Once they learn the concepts they can apply them in their businesses. They can out how their labor and capital decisions affect the productivity of workers, they are able to know the difference between short and long run production in their business and they can estimate the fixed and variable costs for

their particular businesses. They can also do hypothetical calculations of total costs, total revenues and profit maximization points for their businesses.

Market Structures

Another important topic that is taught in Principles courses – here students learn about the different market structures and their characteristics as well as their profitability and pricing power for firms in these market structures. Thus as an application students can figure out the specific market structure that their business and product operates in, as well as formulate strategies to appropriately manage the business and sell the product to maximize profits. Students can also suggest strategies to move into more profitable market structures, for example suggest merger strategies to reduce competition or suggest product differentiation strategies to gain pricing power.

Resource Markets

Students learn about resource markets, demand and supply in these markets as well as the equilibrium price of resources. They can thus apply these concepts to strategize about the wages and the price of capital and raw materials that their business will pay, as well as develop expectations for future prices of these resources.

Based on the availability of time, apart from these core concepts in a principle of microeconomics class, some extra topics could also be used for the project based learning experience, for example: Government Interventions into Markets, Externalities and Property Rights, Imperfect Information, and International Trade. However given the large amount of material that is usually covered in these classes as well as the time set aside for assignments and exams, it is unlikely that there will be a lot of time left over to appropriately interact with the students with respect to their project – thus in most instances it probably would be advisable for instructors to stick with the basic core concepts and their applications outlined above. Also for students this is usually their first or second class of economics so it would probably be better to stick to short and simple applications of the core concepts and avoid more complex problems, as this would lead to overwhelmed and eventually uninterested students, thus defeating the purpose of this exercise.

LEARNING OUTCOMES

The primary objective of the current pedagogical tool used in the International Economics class is for students to learn how to apply the theories of international trade and international finance to a real life business venture. Thus they become intimately familiar with the country of their choice as well as the product of their choice. They are able to remember

economic and financial characteristics of this country. Part of the reason for having the project run concurrently as the topics being taught in the class was that the students get to apply their text based learning to a real world situation of their choosing at the exact same time as they are learning the topics. However, during the course of the semester they also learn something equally valuable - they each learn from the other students and their choices of a unique country and a unique product. This secondary learning is obviously quite valuable, since they are quite busy with their own projects and it would be very difficult for them to go out and research every different country. But they are able to listen to and analyze their classmates' presentations and thus absorb a lot of information about the economic structures in all these different countries. This was the primary reason that I chose to go with individual projects rather than group projects. It gave the opportunity for the class to listen to presentations about 11 countries and 11 products rather than, say, 5 countries and 5 products. This obviously enriched the class learning experience.

The course also nicely aligns with the overall learning goals of the business major. As anyone teaching in an undergraduate (or graduate) business program is aware, accreditation agencies are very particular about students satisfying the learning goals that have been set for the major. Also in recent years there has been a marked shift towards getting knowledge about globalization and the economic and cultural effects of the global society into the curriculum not just for business degrees but almost all degrees. This course aligns with the basic learning goal of the business major: Graduates have functional business knowledge as well as employ critical thinking and analytical skills. Moreover, the following learning goal of the major is also satisfied – Graduates have a multicultural and global perspective; in particular they demonstrate knowledge of the international business environment, the influence of globalization on business and society and the role of diversity (social, cultural, economic and political) on businesses.

Students have four basic learning outcomes from each of the topics that were discussed above. They learn about the specific material in class and are able to understand the theories; they research that topic for their specific country and product, are able to find the information that they are looking for and are able to analyze the impact of the information on their business; they present their results to the class and are able to appropriately convey the information and strategies of their business and formulate cohesive arguments to defend their particular strategies; and they write a paper about the particular topic that they researched and are able to satisfactorily communicate in writing. Thus it is not just a course where the students learn topics, memorize and then forget once they are done. They have to satisfactorily complete all four segments of the learning process.

There were a few instances of surprising learning outcomes that students realized themselves. For instance one student chose Columbia as the country and ended up doing a substantial amount of research about the free trade agreement between the United States and Columbia that is currently in the legislative process, presenting in great detail all the issues surrounding the debate. Another student chose China as the country, and also presented in detail

the agreement currently signed between the United States and China regarding the agricultural exports from the US to China. A third student chose Brazil as the country, and found out from the source given above that Brazil's tariffs keep changing daily. The student ended up calling the 800 number listed on the resource and spoke to a representative of the Brazilian government who explained the particular tariff rate that the student was interested in. All of these examples point to learning by the students that goes far beyond anything that is expected from a learning model built solely around the text book and lectures. All of this provided valuable experience for the students about real world events and their economic impacts on businesses.

Similar learning goals can be satisfied for a Principles of Microeconomics course. Usually this is the first or second course in economics that the students take, and thus the learning goals are about grasping the core concepts and being able to apply them in real world situations. This project based learning approach should nicely align with both of these goals. Students are also required to research certain topics and be able to apply the results of the research towards better understanding the course material. Once again this project based learning approach can tie in nicely with that goal. Once this course is taught, there are likely to be a few positive surprises about student learning outcomes, just as was described above in the international economics course.

RESULTS OF SURVEY ABOUT STUDENT ATTITUDES TOWARDS PROJECT BASED LEARNING

As part of the pedagogical change, I decided to conduct a survey about the attitudes of the students toward this new method of learning in the international economics course. The survey had mostly qualitative or descriptive questions rather than numerical or quantitative questions. So, rather than ranking the course from good to bad or providing a number from high to low about the efficacy of learning in the course, the survey asked the students to describe what they liked and did not like about the course and also explain if the course provided them with a better learning experience than a traditional lecture and assignment format. Students were asked to remain anonymous in their comments, and care was taken to ensure that the instructor (I) did not get to see the response sheets that the students were turning in. It is not a critical part of the analysis, but I wanted to provide anonymity to the students in order to get the best and most honest feedback from the students. Not only would it help in analyzing the efficacy of the current pedagogical tool but it would also provide a basis for making improvements to the course for the next time it is offered. In order to provide a base for the comparison with respect to previous pedagogical techniques used, students were provided a brief description of the old teaching format (i.e. it consisted of lectures and assignments were homeworks, exams and an end of the semester project). They also seemed familiar with the lecture and assignment format from some of the other classes that they took, and they seemed especially aware of the standard nature of the assignments and exam formats that they had encountered in some other classes, thus improving

the validity of their comments regarding the comparison of teaching methods used. The students gave back pretty detailed comments and opinions about the project based learning that they experienced. The student comments were also made a lot richer by the fact that not all the comments were completely positive. On the positive side, students liked the idea of applying their knowledge that they gathered in class to a real life project. They felt that exams and such like assignments usually forced them to cram and completely forget the topics after the exams were done. A project on the other hand was more exciting and provided an incentive to retain their knowledge. Also students appreciated the block by block building technique that the assignments (papers and presentation) forced upon them – they felt it led to better retention of knowledge, especially since the final project was a combination of all the blocks built. Students also found it useful that each person was asked to choose a different country and different product, thus leading to a lot of learning from each other. Each person had a unique country and product and although there were more than one country chosen from the EU which implied similar currency and monetary policy prescriptions, it did not detract from the learning since the countries and its economic and financial characteristics were different. This did provide some positive learning experience about the nature of economic common markets. On the negative side, a student had the opinion that home work problems or quizzes and exams in addition to the project could add to the learning experience because it would provide students with assignments that would test their knowledge in a more formatted and controlled way. This was actually an excellent suggestion since the only gap in the learning outcomes presented above seemed to be in the area of testing students' knowledge about the subject matter directly. Thus there has been an appropriate addition to the assignments for the next time the course has been offered - to have short online home works that test this very aspect. Also students felt that some more complex topics like trade strategies or business strategies as well as an analysis of competitors and their strategies would provide a more complete educational experience. These would be worthwhile additions time permitting, but it also suggests that the standard International Business class was unable to provide the student with this knowledge.

EXTENSIONS TO OTHER COURSES

This new pedagogical technique was applied to the course International Economics that is part of the international Business concentration in the BBA degree. However some of the techniques could be easily applied to other economics courses that are taught as part of a Business degree or even as part of a Liberal Arts degree. For example in this course, the emphasis was on operating a business in the international environment using the tools of international trade theory, international trade policy and international monetary theory and policy. This emphasis on operating a business makes sense as students pursuing a Business degree usually have working in the business world for a firm or operating their own business as part of their career plans. Since they have an International Business concentration it is only

natural that they would think of working in a company that has significant international business exposure or at some future point operating their own business with international exposure. However for a similar course as part of a Liberal Arts BA or BS degree, the course could have a project that looks not only at the business operations side but also the public policy side. Thus the project could involve deciding an optimal tariff based on the welfare effects, an application that would be pretty meaningless to a student that is part of an international business firm; or they could look at the benefits and costs of environmental regulations in an international setting. A similar structure could also be used for an Economic Development course, where students learn a lot of similar topics regarding trade, international finance and less developed economies.

Similarly for Macroeconomics course knowledge of unemployment, inflation, growth, and the effect of fiscal and monetary policies on interest rates, prices and output can be used to optimize business decisions. With all of these applications students will get a chance to look at real life applications of basic economic models rather than just going over the class lectures, power point slides and text to prepare for an exam. They will thus be more engaged and retain more of the knowledge that they gain in class when they are asked to apply it in a real life business situation or a real life public policy decision making process. It should also be noted that the entire course in any economics topic does not need to be project based, as explained in the description of the Principles of Microeconomics course above.

CONCLUSIONS

In this paper we have provided a pedagogical tool that can be used to better educate students of economics especially those that are in business schools and graduate with an undergraduate business degree. The tool is not a new one in that it has been used in other business disciplines like Management, Marketing and Finance. The idea is to use a project based learning method, where students choose a business that they would operate in an international setting, choose a country that they would like their firm to do business with, analyze the product that they would like to import or export based on the theory of comparative advantage, analyze the market for their product, analyze the impact of trade policies in the respective countries on their product and hence their firm's bottom line, be aware of the currencies in the two countries and the exchange rate between them, analyze the fluctuations in the exchange rates and be able to manage the risk of such fluctuations, be aware of inflation rates and analyze the effect on their firm, and use the theoretical effects of monetary policy to approximately predict inflation and exchange rate fluctuations for their countries in question. Thus they get a pretty complete picture of the role of international economics on an international business and are able to comprehensively apply the tools of international trade and finance to come up with optimal solutions for their firm. This project based learning tool is not restricted only to economics courses taught in the business school but can be easily modified and changed to suit the needs of a liberal arts student as well.

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STUDENTS' PERCEPTION OF EFFECTIVE TEACHING

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ABSTRACT

This study used descriptive statistics and an Ordered Probit regression approach to assess how students value various instructor characteristics and teaching practices. Surveys completed by 387 students at Thompson Rivers University in the Winter 2010 term obtained their relative preferences for characteristics of instructors (e.g., how organized the instructor is, the instructor's knowledge, and enthusiasm of the instructor) and teaching practices (e.g., using components such as group work, attendance, and class participation in the computation of the final course grade, as well as whether to grade assignments). This paper discusses the instructor characteristics and teaching practices students value most highly, focusing on the major contribution of our study—how perceptions of teaching characteristics vary among students of different genders, years of study, and cultural backgrounds. Faculty who understand the valued instructor characteristics and teaching practices can work on improving or changing their own characteristics and can endeavor to employ preferred teaching practices so as to engage students of different backgrounds more fully.

INTRODUCTION

This study uses descriptive statistics to assess the relative weights that students enrolled in Economics courses assign to various characteristics of their instructors and teaching practices. We also studied how the perceptions of characteristics of instructors and teaching practices vary between students of different genders, majors, years of study, and cultural backgrounds (domestic vs. international). This approach allowed us to determine the weights that various groups of students place on various characteristics of instructors and teaching practices, some of which are specific to Economics instruction. We believe that the results of this study will help optimize teaching and grading strategies for Business students in Economics courses and also will help in faculty recruitment.

Much of the literature examines student perceptions of teaching through an indirect approach, by which researchers try to glean student preferences about teaching through study of student evaluations of instruction[1]. Forms for student evaluation of instruction usually contain questions about characteristics of an instructor's teaching, but with all characteristics given equal weight. Chang's (2000) paper is typical in this literature. The author studies student evaluations of instruction to determine that the best predictors of how students evaluated the quality of teaching of their instructors were student enthusiasm, participation, expected grade, grading

standard, and course difficulty. Davies et al. (2007) use the student evaluation scores from an Economics department in an Australian university to investigate what factors, besides the instructor, influence average student evaluation scores. This research is relevant to our proposed study because the authors focus on teaching Economics. The study finds that students' evaluations were affected by students' cultural backgrounds as well as characteristics of the courses and materials, such as whether the course topics are relatively quantitative in nature and the quality of textbooks and workbooks. Also related to our study is research by Gokcekus (2000) applying a multinomial logit model to data on student evaluation scores to investigate, in an indirect manner, how students value Economics courses. The study finds that characteristics of the instructor and the level of intellectual stimulation had the strongest influence on students' valuation of courses.

A number of studies use the direct approach of conducting surveys to explore students' expectations of and preferences in teaching. Using a large U.S. national database, Cochran and Hodgin (2001) find that enthusiasm, careful preparation, clarity of communication, and fair grading standards contribute to enhancing student satisfaction. Enthusiasm is given equal importance by instructors and students. However, students place about three times as much emphasis on fair grading and nearly twice as much weight on preparation as do instructors. A typical study by Sander et al. (2000) is a typical study that finds that students expected to be taught by formal and interactive lectures but preferred to be taught by interactive lectures and group-based activities. To the best of our knowledge, no study has used Canadian data to determine how students rank various aspects of effective teaching in Economics courses.

DATA AND METHODOLOGY

The study's data come from 387 students enrolled in various levels of Economics courses at Thompson Rivers University—a small, Canadian, primarily undergraduate institution—during the January-April term of the 2009-2010 academic year. Data collection took place during the 10th and 11th weeks of the 12-week term. During administration of the survey, data collectors explained its purpose to students and answered questions from students to make sure they understood the survey questions. Of the students surveyed, 60% are male, and 61% are of domestic (Canadian) origin, with the rest being international students. Institutional Ethics Committee approval was granted prior to conduct of the survey.

The study adopted a descriptive statistics approach to examine students' preferences over various criteria for effective teaching. The study focused on two aspects: instructor's characteristics and teaching practices. Students were asked to rate each characteristic on a scale from 1 (*not important*) to 4 (*very important*). The study computed means for all responses and compared the means for subgroups defined on the basis of gender, student status (Canadian/international), and year of study.

Table 1: Descriptive Statistics: Mean Values of Variables					
Variables	Overall	Female Student	Male Student	Domestic Student	International Student
Male Student	.60 (.025)			.57 (.032)	.67 (.038)
Female Student	.40 (.025)			.43 (.032)	.33 (.038)
Domestic Student	.61 (.024)	.43 (.032)	.57 (.032)		
International Student	.39 (.024)	.33 (.038)	.67 (.038)		
Average Midterm Marks	71.390 (.704)	72.701 (1.084)	70.542 (.922)	73.117 (.895)	68.662 (1.109)
Cumulative GPA	3.062 (.030)	3.16 (.049)	2.996 (.038)	3.129 (.037)	2.956 (.050)
Daily Study (hours)	2.867 (.907)	3.316 (.158)	2.577 (.118)	2.566 (.108)	3.343 (.176)
First Year	.271 (.023)	.237 (.035)	.294 (.030)	.257 (.028)	.293 (.037)
Second Year	.338 (.024)	.375 (.039)	.315 (.030)	.338 (.031)	.34 (.039)
Third Year	.235 (.022)	.25 (.035)	.226 (.027)	.283 (.029)	.16 (.030)
Fourth Year	.085 (.014)	.092 (.024)	.081 (.018)	.114 (.021)	.04 (.016)
Sample Size	387	237	150	237	150
Note: Standard errors are shown in parentheses					

To determine how various student attributes such as gender, student status and year of study impact the ranking of teachers' characteristics as well as rankings of different teaching practices, the study used an Ordered Probit method. The study uses an Ordered Probit method because the students' rankings of teachers' quality and teaching practices are in ordered categories. For example, students rank the characteristic "helpfulness" on a scale from *least important* (1) to *most important* (4). The Ordered Probit Model can be expressed as:

$$yi^* = xi\beta + \varepsilon i \quad (1)$$

where yi* is the dependent variable representing rankings of various teacher qualities as well as various teaching practices. The xi's are the independent variables of gender, student status and student's year of study, and the βs are the estimated coefficients. The observed rankings are given by yi, which takes one of the values 1, 2, 3 or 4.

The observed y is of the following forms:

$y = 1$ (or not important) if $\mu 0 < y^* < \mu 1$ (2a)
$y = 2$ (or somewhat important) if $\mu 1 < y^* < \mu 2$ (2b)
$y = 3$ (or important) if $\mu 2 < y^* < \mu 3$ (2c)
$y = 4$ (or very important) if $\mu 3 < y^* < \mu 4$ (2d)

where $\mu 0$, $\mu 1$, $\mu 2$, and $\mu 3$ are threshold variables to be estimated in the ordered probit model using a maximum likelihood procedure. The probabilities of receiving particular rankings based on the slope and threshold estimates are shown in the following equations:

$P[y = 1] = \Phi(\mu 1 - x_i\beta) - \Phi(\mu 0 - x_i\beta)$ (3a)
$P[y = 2] = \Phi(\mu 2 - x_i\beta) - \Phi(\mu 1 - x_i\beta)$ (3b)
$P[y = 3] = \Phi(\mu 3 - x_i\beta) - \Phi(\mu 2 - x_i\beta)$ (3c)
$P[y = 4] = \Phi(\mu 4 - x_i\beta) - \Phi(\mu 3 - x_i\beta)$ (3d)

where Φ is the standard normal cumulative distribution.

RESULTS

Descriptive statistics from the survey responses appear in Tables 2 and 3. The most notable results shown in Table 2 are: Instructor's knowledge is the most valued characteristic, followed by instructor's ability to explain clearly and instructor's preparedness. Other important characteristics are instructor's helpfulness and instructor's enthusiasm. To the females, domestic students, first-year students, and second-year students, instructor's knowledge is the most valued characteristic. Instructor's ability to explain clearly is the most valued characteristic to the males, third-year students, and fourth-year students. International students consider instructor's preparedness as the most important characteristic among all instructor qualities.

Table 2: Student Ratings of Instructor Characteristics (scaled from 1 [*not important*] to 4 [*very important*])

	Prepared	Clear	Organized	Helpful	Enthu-siastic	Fair	Know-ledgeable	Concer-ned
Overall	3.62 (.03)	3.62 (.04)	3.48 (.04)	3.52 (.04)	3.26 (.04)	3.55 (.04)	3.65 (.03)	3.33 (.04)
Male	3.72 (.05)	3.74 (.05)	3.57 (.06)	3.66 (.05)	3.33 (.06)	3.66 (.05)	3.73 (.04)	3.45 (.06)
Female	3.56 (.04)	3.54 (.05)	3.41 (.05)	3.43 (.05)	3.22 (.05)	3.49 (.05)	3.61 (.04)	3.24 (.05)
Domestic	3.69 (.04)	3.74 (.04)	3.54 (.04)	3.63 (.04)	3.32 (.05)	3.67 (.04)	3.76 (.03)	3.37 (.05)
International	3.51 (.06)	3.43 (.07)	3.38 (.07)	3.34 (.07)	3.17 (.07)	3.36 (.07)	3.49 (.06)	3.25 (.07)

Table 2: Student Ratings of Instructor Characteristics
(scaled from 1 [*not important*] to 4 [*very important*])

	Prepared	Clear	Organized	Helpful	Enthu-siastic	Fair	Know-ledgeable	Concer-ned
First Year	3.56 (.06)	3.57 (.07)	3.36 (.07)	3.45 (.08)	3.23 (.08)	3.54 (.07)	3.61 (.07)	3.19 (.08)
Second Year	3.62 (.05)	3.65 (.06)	3.54 (.06)	3.56 (.06)	3.27 (.06)	3.53 (.06)	3.71 (.05)	3.38 (.07)
Third Year	3.67 (.06)	3.73 (.05)	3.51 (.07)	3.62 (.07)	3.35 (.08)	3.63 (.07)	3.70 (.05)	3.40 (.09)
Fourth Year	3.73 (.08)	3.73 (.10)	3.67 (.09)	3.67 (.11)	3.24 (.15)	3.64 (.10)	3.70 (.11)	3.39 (.13)

Note: Standard errors are shown in parentheses.

Table 3: Student Ratings of Course Grade Determinants
(scaled from 1 [*not important*] to 5 [*very important*])

	Group Work	Attendance (as part of grade)	Participation (as part of grade)	Graded Assignments	Practice Questions	Mainly Lecture
Overall	2.32 (.05)	2.58 (.06)	2.45 (.05)	2.53 (.05)	3.42 (.04)	2.82 (.04)
Male	2.15 (.08)	2.59 (.09)	2.40 (.09)	2.60 (.08)	3.48 (.06)	2.86 (.06)
Female	2.43 (.06)	2.57 (.08)	2.48 (.07)	2.49 (.07)	3.38 (.05)	2.89 (.05)
Domestic	2.13 (.06)	2.46 (.07)	2.28 (.07)	2.37 (.07)	3.53 (.05)	2.82 (.05)
International	2.62 (.08)	2.77 (.09)	2.71 (.08)	2.79 (.08)	3.25 (.06)	2.96 (.06)
First Year	2.29 (.10)	2.61 (.11)	2.37 (.10)	2.44 (.10)	3.27 (.07)	2.88 (.07)
Second Year	2.37 (.08)	2.62 (.10)	2.47 (.09)	2.50 (.09)	3.44 (.07)	2.91 (.06)
Third Year	2.23 (.11)	2.52 (.13)	2.43 (.12)	2.54 (.11)	3.53 (.07)	2.92 (.08)
Fourth Year	2.18 (.18)	2.27 (.19)	2.39 (.18)	2.82 (.18)	3.73 (.09)	2.76 (.14)

Note: Standard errors are shown in parentheses. The rankings for Attendance (being present in class) and Participation (actively asking and/or answering questions; participating in discussions) indicate how important it was that these factors be evaluated by the instructor and included as a percentage of the course grade. Practice Questions refers to students being provided with sample exam questions that are not graded. Mainly Lecture refers to a preference for class time being spent primarily on traditional lectures, rather than on in-class student work, whether as groups, individually or in the form of participation in question-and-answer sessions.

One point to note is that mean ratings for various instructor characteristics, including preparedness, ability to explain clearly, organization, helpfulness, and fairness, tend to increase as students become more mature, progressing from the first year to the fourth year.

Students were also asked about the importance of using various teaching practices. In particular, students were asked about the importance of having a chance to work in a group, having a class mainly in lecture format, and having their course grade partially determined by class attendance and/or class participation. They also were asked to assign a level of importance to graded assignments and practice questions.

The most notable results shown in Table 3 are that all groups of students think that the provision of practice questions is the most important practice and having a class mainly in the lecture format is the least important practice. Ignoring practice questions (or, alternatively, focusing only on components of grading with a positive weight), the study participants thought that taking attendance is the most important practice. In particular, female, domestic, and first- and second-year student subgroups thought that including attendance at lectures as a determinant of a student's course grade is the most important teaching practice. In contrast, male, international, and third- and fourth-year students thought that use of graded assignments is the most important teaching practice.

The results of the Ordered Probit Models are shown in Table 4 and 5. Table 4 provides results of the regression on the rankings for faculty quality. The first column shows that females provide a lower ranking to instructor's preparedness than do males. Similarly, international students have a lower valuation than do domestic students of instructor preparedness as an important quality. This column also suggests that there is no significant difference among students of different years with respect to valuation of instructor preparedness as an important quality. The second column of Table 4 shows regression results for students' ranking of instructor's ability to explain clearly. Here also, in comparison to males and domestic students, females and international students, respectively, view an instructor' ability to explain clearly as a less important quality. On the other hand, year of study has no impact on students' rankings of the instructor's ability to explain clearly. The third column suggests that compared to first-year students, second- and fourth-year students place a higher value on an instructor's organizational abilities. Regression on the rankings of instructor's helpfulness, as shown in the fourth column of Table 4, suggests that compared to males and domestic students, females and international students, respectively, provide place a lower value on an instructor's helpfulness. However, student's year of study has no impact on the ranking of instructor's helpfulness as an important quality. Results for instructor's enthusiasm, as shown in the fifth column of Table 4, suggest that compared to domestic students, international students have a lower valuation of this quality. However, student's gender and year of study have no impact on the ranking of instructor's enthusiasm as an important quality. The sixth column of Table 4 suggests that there is no significant difference in the ranking of instructor's fairness as an important quality with respect to a student's gender, status (domestic/ international) and year of study.

Table 4: Factors Influencing Ranking of Teacher's Quality: An Ordered Probit Approach							
	Instructor Prepared	Instructor Clear	Instructor Organized	Instructor Helpful	Instructor Enthusiastic	Instructor Fair	Instructor Knowledgeable
Female	-.283**	-.251**	-.175	-.273**	-.069	-.181	-.085
	(.138)	(.131)	(.130)	(.135)	(.119)	(.132)	(.138)
International	-.312*	-.493*	-.181	-.341*	-.211**	-.470	-.465*
	(.131)	(.128)	(.125)	(.126)	(.110)	(.126)	(.131)
Second Year	.108	.144	.248***	.165	.049	-.055	.148
	(.151)	(.158)	(.138)	(.150)	(.138)	(.150)	(.161)
Third Year	.162	.183	.146	.208	.130	.079	.013
	(.178)	(.175)	(.163)	(.173)	(.159)	(.178)	(.178)
Fourth Year	.244	.219	.439**	.323	.015	.067	.097
	(.236)	(.269)	(.230)	(.257)	(.232)	(.245)	(.281)
Notes: Standard errors are shown in parentheses. *, ** and *** indicate that coefficient is significant at the 1%, 5%, or 10% level.							

Table 5 shows the regression results of student rankings of teaching practices. The first column of this table suggests that female students rank group work more highly than male students. Also, compared to domestic students, international students have a higher preference for group work. However, with respect to year of study, there is no significant difference in the preference to group work. Regression results of the student rankings of inclusion of attendance as part of grade, as shown in the second column of Table 5, suggest that compared to domestic students, international students have a higher preference for this teaching practice. On the other hand, gender and year of study have no impact on the ranking of this teaching practice. The third column of Table 5 shows the results of the regressions for the ranking of participation as part of grade. The international students rank this teaching practice higher than do the domestic students. On the other hand, there is no significant difference in ranking this teaching practice between male and female students and among students of different years. The fourth column of Table 5 suggests that international students and fourth-year students have a higher preference for graded assignments compared to domestic students and first-year students. On the other hand, there is no significant difference in ranking for this teaching practice between males and females. The results of regressions determining the ranking of providing practice questions are shown in the fifth column of Table 5. The results show that international students have a lower preference for practice questions than do domestic students. Compared to the first-year students, the second-year, third-year and fourth-year students have a higher preference for providing practice questions as a teaching practice. Finally, the last column of Table 5 presents the results for the ranking of "mainly lecture" as the style of teaching. There are no significant differences between male and female students, between domestic and international students, and among students from different years in terms of ranking.

Table 5: Factors Influencing Ranking of Teaching Practice: An Ordered Probit Approach						
	Group Work	Attendance (as part of grade)	Participation (as part of grade)	Graded Assignments	Practice Questions	Mainly Lecture
Female	.269* (.112)	-.053 (.111)	.048 (.113)	-.164 (.111)	-.104 (.123)	.053 (.111)
International	.469* (.110)	.231** (.128)	.376* (.110)	.456* (.113)	-.312* (.116)	.122 (.106)
Second Year	.164 (.131)	.033 (.132)	.133 (.130)	.119 (.134)	.287** (.144)	.193 (.136)
Third Year	.012 (.157)	-.041 (.161)	.137 (.158)	.224 (.150)	.382* (163)	.239 (.146)
Fourth Year	-.034 (.230)	-.249 (.195)	.144 (.201)	.603* (.213)	.770* (.252)	-.019 (.227)
Notes: Standard errors are shown in parentheses. *, ** and *** indicate that coefficient is significant at the 1%, 5%, or 10% level.						

CONCLUSION

Using survey data from economics students at a small, primarily undergraduate university with a significant number of international students, we assessed how students value various instructor characteristics and teaching practices. We found that students perceived the most important characteristics of an effective teacher to be his/her knowledge, his/her ability to explain material clearly, and his/her adequate preparation. Students perceived the most important teaching practice to be provision of practice questions and the least important to be class time dominated by traditional lectures. The study also revealed that students think that having attendance included as part of the course grade and having graded assignments are relatively important teaching practices.

The findings of this study parallel the results from Cochran and Hodgin (2001), who also found that careful preparation, fair grading, and clarity in communication enhance teaching effectiveness. The study also supports the finding of Sander et al. (2001) that students do not prefer teaching in traditional, lecture-focused format.

The findings of this study have significant policy implications, especially for teaching-focused universities. Given that their emphasis on teaching effectiveness, they should undertake to understand as fully as possible students' perceptions regarding effective teaching. Faculty and students are both vital components of the teaching process. Traditionally, universities focus on faculty views of the teaching process, often ignoring or taking minimal account of what students think. Such an approach may lead to an incomplete understanding of teaching effectiveness. This research asked students directly about factors that determine effective teaching. Teaching-focused universities can use the findings of this study to enhance their understanding of effective teaching and thus improve faculty teaching effectiveness. Finally, when hiring new faculty, the

hiring committee may look at whether applicants possess desirable characteristics and whether their teaching practices involve the desirable attributes identified in this study.

This study is based on a small Canadian university and specifically on the business department. Future studies can use data from students at large universities and at other departments to check the robustness of the results of the current study.

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ENDNOTES

[1] In the faculty evaluation using student questionnaire forms, students are given some faculty characteristics—for example "the faculty is helpful" or "the faculty is well prepared" —and then are asked to respond whether or how much a particular faculty member is helpful or prepared. Using evaluation scores from student questionnaires is a way to find out what factors influence faculty evaluation. We term this method an indirect approach to identify qualities of effective teaching. On the other hand, in the direct approach, students are directly asked to identify qualities of an effective teacher.

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SOVEREIGN CREDIT QUALITY IN THE EUROZONE: A PRELIMINARY CLASSIFICATION SYSTEM

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ABSTRACT

The idea of common currency with single monetary policy without strongly enforced fiscal guidelines is found to be a flawed structure in the Eurozone from the aftermath of recent years' financial crisis. The strong currency policy in the Eurozone does not help economically weak member countries to compete effectively. Growing dependence on external capital inflows to cover weaker countries' rising trade imbalances can only make the country fiscally less secure. Without any punitive trigger, an economically weak country can fall into a downward spiral and cause currency union to come apart. This paper examines and compares the economic profiles of Eurozone countries to observe how similar or dissimilar these countries are on the seven economic dimensions. This analysis helps us to assess the countries' capacity to pay their debt. Classification and clustering methodology of Mahalanobis D^2, canonical correlation, and canonical discriminant is applied to the economic data collected for Eurozone countries. Our analyses reveal that Greece, Italy, and Spain have been classified and separated from the other countries on the basis of seven economic factors and therefore belongs to a separate group that may lack the capacity to pay their debt. Thus, this analysis provides a diagnostics on the determinants of sovereign credit quality in the Eurozone countries from the lenders perspective.

INTRODUCTION AND BACKGROUND

Sovereign credit risk is receiving growing attention over the last three years heightened by the effects of financial crisis of 2008. To minimize the damage induced by the financial crisis western nations accepted transfer of a significant portion of private sector debt onto their respective national balance sheets. The anemic economic growth rates exacerbated their fiscal woes which, in turn resulted in steeply rising debt/GDP ratios. Alarmed by this trend, the bond rating agencies began issuing watches and warnings of credit downgrades. The world's largest debtor nation, the U.S.A was not spared. The Standard & Poor's rating agency lowered U.S. Treasury debt rating to AA^{+}. This is a significant blow to the U.S. credibility and left a historic blemish in its credit record. Theoretically, finance text books can no longer treat U.S. Treasury yield as a surrogate for "Risk-Free" rate. As a practical matter, the U.S, debt downgrade did not materially affect Treasury's borrowing cost. This is because of the Federal Reserve's willingness

to supply abundant credit. Currently, bond market is treating this development as temporary and insignificant.

TABLE 1: Mahalanobis Squared Distance- D^2 by Countries.

From	Lith	Aus	Bel	Cyp	Finld	Swed	Fran	Germ	Hung	Irel	Poln	Denm	Ital	Malta
Lith	0.00	147.00	160.31	71.71	50.16	69.55	83.00	134.42	72.14	46.67	26.09	77.38	233.03	79.01
Aus	147.00	0.00	10.23	31.90	30.62	24.84	17.78	2.57	35.25	47.34	55.18	17.62	33.59	21.22
Bel	160.31	10.23	0.00	28.90	42.95	45.31	14.37	6.89	26.36	54.04	61.91	33.22	9.35	18.82
Cyp	71.71	31.90	28.90	0.00	16.39	31.49	5.64	29.19	15.91	15.41	14.69	21.46	56.87	1.66
Finld	50.16	30.62	42.95	16.39	0.00	4.06	14.56	24.41	18.56	21.76	11.42	3.49	89.12	13.94
Swed	69.55	24.84	45.31	31.49	4.06	0.00	23.31	20.20	29.64	33.99	24.53	2.39	94.65	24.99
Fran	83.00	17.78	14.37	5.64	14.56	23.31	0.00	13.19	10.28	14.47	17.84	16.35	40.76	1.47
Germ	134.42	2.57	6.89	29.19	24.41	20.20	13.19	0.00	25.44	45.25	48.82	14.26	30.52	18.04
Hung	72.14	35.25	26.36	15.91	18.56	29.64	10.28	25.44	0.00	27.27	21.15	23.72	55.27	12.11
Irel	46.67	47.34	54.04	15.41	21.76	33.99	14.47	45.25	27.27	0.00	7.04	32.46	96.02	14.92
Poln	26.09	55.18	61.91	14.69	11.42	24.53	17.84	48.82	21.15	7.04	0.00	24.96	110.47	15.77
Denm	77.38	17.62	33.22	21.46	3.49	2.39	16.35	14.26	23.72	32.46	24.96	0.00	75.07	16.61
Ital	233.03	33.59	9.35	56.87	89.12	94.65	40.76	30.52	55.27	96.02	110.47	75.07	0.00	45.89
Malta	79.01	21.22	18.82	1.66	13.94	24.99	1.47	18.04	12.11	14.92	15.77	16.61	45.89	0.00
Neth	142.91	2.06	21.06	39.45	29.65	20.12	24.44	6.29	43.59	48.48	56.18	15.96	51.66	28.13
Roma	6.98	109.91	130.79	51.31	35.32	50.24	62.45	105.21	59.41	28.40	15.36	55.51	199.39	57.40
Portu	86.17	49.32	30.45	7.08	34.97	56.27	10.12	41.66	17.37	23.44	25.84	43.81	48.60	8.50
Bulg	3.08	149.24	161.44	65.83	50.54	73.23	84.19	138.18	72.98	51.29	27.61	77.44	231.47	76.40
Gree	208.09	78.74	36.25	56.72	111.66	134.56	49.26	71.30	57.81	87.73	104.66	111.98	23.10	52.56
Spain	12.36	163.12	156.68	67.29	63.69	93.05	80.95	144.81	70.69	51.41	32.26	96.12	216.13	76.85
Esto	6.83	187.55	208.77	105.22	69.58	88.09	121.33	173.13	106.40	81.54	51.11	98.66	292.86	115.09
UK	69.59	17.98	24.98	8.72	11.60	17.67	3.98	17.10	14.61	8.10	12.59	13.26	59.85	4.91
Latv	3.72	189.54	199.79	100.34	75.22	98.49	113.90	173.09	93.90	72.55	46.70	107.43	277.11	109.76
Slovk	3.72	122.20	132.30	51.93	36.70	55.48	61.78	110.15	57.92	32.20	14.76	61.99	198.36	57.89
Luxe	62.28	52.17	89.99	57.22	16.74	9.23	52.79	51.57	60.69	46.77	35.26	16.77	155.85	52.55
Slovn	30.43	49.71	68.80	19.73	7.42	15.30	24.21	47.44	31.42	12.11	5.22	16.33	123.19	21.09
Czech	32.30	46.86	65.13	18.24	6.25	13.86	22.25	44.34	28.83	12.17	4.83	14.82	118.47	19.17

However, some new dangers may yet lie ahead for public finances of several western nations as the new round of capital standards are enforced by Basel committee and the Volker rule under Dodd-Frank Bill is implemented in the U.S. While the western nations, in general, experienced weakening of their public finances, some nations like Canada, Germany, UK, and Brazil seem to be holding up quite well.

Fiscal Fissures in the Eurozone

The move to adopt a common currency with single monetary policy but without a commonly enforced fiscal discipline is flawed from the outset. Adopting a strong currency (€), which is essentially a derivative of Deutsche mark does not help an economically weak member country to compete effectively in export markets. This relatively weak external trade position forces a nation to import more capital (mostly through the sale of debt instruments) to sustain itself. Continuation of status quo does not help the weak country to improve its competitive position. Continuously growing dependence on external capital inflows to cover its rising trade imbalances can only make the country fiscally unsound. Without an automatic punitive trigger, an economically weak country such as, Spain, Greece or Italy can get into a downward spiral without a proper recourse and can cause the bonds of currency union to rupture. Strong currency for an externally noncompetitive economy is no cure for its ills. The Eurozone has to rethink and redesign its economic union so as to foster an enduring harmony in their economic profiles.

Sovereign Credit Quality

A credit rating is simply a reflection of the borrower's **ability** and **willingness** to return the principal along with the interest to the lender. When the borrower and the lender are both legally domiciled in a single nation, it is convenient for the lender to assess and monitor the borrower's ability to pay. The legal system can act as an imposing deterrent to the laxity in payment. However, when the borrower and lender are separated by national boundaries, the lender does not have as much enforcing power to motivate a less willing borrower to pay. In addition, if the borrower is a sovereign nation, a foreign lender (bond buyer) has little or no power to make an unwilling borrower to pay. Therefore, judging the borrowers willingness to pay is critical in assessing the credit risk of a sovereign borrower. A sovereign nation can get away with nonpayment in the name of "national interest". History is replete with the examples from Greece, Central Europe, Russia, and Latin America. In international lending, legal recourse to the borrower is very limited at best. In light of these limitations, the buyers of sovereign debt are entirely dependent upon the country's capacity to pay and willingness to pay becomes a paramount importance. A sovereign nation's credit rating is affected by its capacity to pay and its willingness to honor its obligation to pay. Let us take up each of these two aspects in detail. First, country's capacity to pay is dependent upon its ability to compete globally and its endowed

resources relative to its debt load. Economic profile of the country can shed some light on this front. Second, country's willingness to pay rests with the nature of its political system, history, social, and cultural dimensions. Totalitarian regime like dictatorships, communist/socialist rulers are more apt to default. In recent years, even democratic regimes have demonstrated dilutive character of their willingness to pay. Diminished commitment to pay was evident in the borrower's demands of concessions on principal write downs (haircuts) and deferred payments (stretched maturities). These things happened with Latin American debt (Brady bonds) under the supervision of IMF and the U.S.A. In the current European debt crisis, similar demands are placed on the Greek lenders. Common currency umbrella over the Eurozone is opening many pathways to risk of moral hazards among the Eurozone members.

TABLE 1 (contd.): Mahalanobis Squared Distance- D^2 by Countries.

From	Neth	Roma	Portu	Bulg	Gree	Spain	Esto	UK	Latv	Slovk	Luxe	Slovn	Czech
Lith	142.91	6.98	86.17	3.08	208.09	12.36	6.83	69.59	3.72	3.72	62.28	30.43	32.30
Aus	2.06	109.91	49.32	149.24	78.74	163.12	187.55	17.98	189.54	122.20	52.17	49.71	46.86
Bel	21.06	130.79	30.45	161.44	36.25	156.68	208.77	24.98	199.79	132.30	89.99	68.80	65.13
Cyp	39.45	51.31	7.08	65.83	56.72	67.29	105.22	8.72	100.34	51.93	57.22	19.73	18.24
Finld	29.65	35.32	34.97	50.54	111.66	63.69	69.58	11.60	75.22	36.70	16.74	7.42	6.25
Swed	20.12	50.24	56.27	73.23	134.56	93.05	88.09	17.67	98.49	55.48	9.23	15.30	13.86
Fran	24.44	62.45	10.12	84.19	49.26	80.95	121.33	3.98	113.90	61.78	52.79	24.21	22.25
Germ	6.29	105.21	41.66	138.18	71.30	144.81	173.13	17.10	173.09	110.15	51.57	47.44	44.34
Hung	43.59	59.41	17.37	72.98	57.81	70.69	106.40	14.61	93.90	57.92	60.69	31.42	28.83
Irel	48.48	28.40	23.44	51.29	87.73	51.41	81.54	8.10	72.55	32.20	46.77	12.11	12.17
Poln	56.18	15.36	25.84	27.61	104.66	32.26	51.11	12.59	46.70	14.76	35.26	5.22	4.83
Denm	15.96	55.51	43.81	77.44	111.98	96.12	98.66	13.26	107.43	61.99	16.77	16.33	14.82
Ital	51.66	199.39	48.60	231.47	23.10	216.13	292.86	59.85	277.11	198.36	155.85	123.19	118.47
Malta	28.13	57.40	8.50	76.40	52.56	76.85	115.09	4.91	109.76	57.89	52.55	21.09	19.17
Neth	0.00	104.07	63.10	146.78	104.04	167.43	179.63	20.10	185.98	119.93	39.64	45.81	43.38
Roma	104.07	0.00	72.58	8.30	186.28	27.88	19.19	45.02	18.75	7.98	40.46	13.81	15.52
Portu	63.10	72.58	0.00	82.16	31.02	65.90	127.58	20.52	112.07	64.15	94.78	41.58	39.73
Bulg	146.78	8.30	82.16	0.00	205.54	13.00	7.49	72.13	6.98	5.98	66.67	30.51	32.18
Gree	104.04	186.28	31.02	205.54	0.00	170.73	274.49	71.38	241.91	177.12	201.68	132.89	129.28
Spain	167.43	27.88	65.90	13.00	170.73	0.00	25.44	79.57	14.28	9.38	102.01	48.23	49.35
Esto	179.63	19.19	127.58	7.49	274.49	25.44	0.00	105.34	5.89	14.99	71.47	48.95	51.35

TABLE 1 (contd.): Mahalanobis Squared Distance- D^2 by Countries.													
From	**Neth**	**Roma**	**Portu**	**Bulg**	**Gree**	**Spain**	**Esto**	**UK**	**Latv**	**Slovk**	**Luxe**	**Slovn**	**Czech**
UK	20.10	45.02	20.52	72.13	71.38	79.57	105.34	0.00	100.09	53.13	36.38	13.87	12.79
Latv	185.98	18.75	112.07	6.98	241.91	14.28	5.89	100.09	0.00	12.90	89.60	53.48	55.84
Slovk	119.93	7.98	64.15	5.98	177.12	9.38	14.99	53.13	12.90	0.00	54.34	20.78	21.73
Luxe	39.64	40.46	94.78	66.67	201.68	102.01	71.47	36.38	89.60	54.34	0.00	16.88	16.74
Slovn	45.81	13.81	41.58	30.51	132.89	48.23	48.95	13.87	53.48	20.78	16.88	0.00	0.15
Czech	43.38	15.52	39.73	32.18	129.28	49.35	51.35	12.79	55.84	21.73	16.74	0.15	0.00

REARCH METHODS

The purpose of this research is to conduct an empirical investigation of the factors governing the determination of a sovereign nation's debt rating. This research uses Canonical Discriminant Analysis to classify countries that are similar in their economic profile and thus acts as a determination factor of sovereign nation's debt rating. The study focuses on the 27 countries of the European Union (EU). The following variables are used in the analysis to capture the "capacity" and "willingness" to pay.

1. Public debt as % of GDP
2. Budget balance as % of GDP
3. Current account balance as % of GDP
4. Foreign Exchange reserves as % of current account balance
5. GDP growth rate
6. Inflation rate
7. Unemployment rate

Canonical Discriminant Analysis will primarily be used to group similar countries together based on these above mentioned economic/financial characteristics. We will also apply multivariate measures such as, Mahalanobis D^2 or Hotelling's T^2 to observe the economic/ financial separation between the EU countries based on the economic/ financial factors.

To facilitate the analysis the following discussion is for two populations for simplicity purposes. Let us consider $\mathbf{x}_{i1}, \mathbf{x}_{i2}, \ldots\ldots, \mathbf{x}_{iNi}$ are random samples from two multivariate normal populations, $\mathbf{N}_p\ (\mu_i, \Sigma_i)$ for i=1,2. Then, the multivariate test-statistic Hotelling's T^2 to test the difference between two mean vectors is defined as,

$$T^2 = \frac{N_1 N_2}{N_1 + N_2}(\hat{\mu}_1 - \hat{\mu}_2)' \hat{\Sigma}^{-1}(\hat{\mu}_1 - \hat{\mu}_2) \quad \text{and} \quad \hat{\Sigma} = \frac{(N_1 - 1)\hat{\Sigma}_1 + (N_2 - 1)\hat{\Sigma}_2}{N_1 + N_2 - 2}.$$

In the above equation, μ_1 and μ_2 are the two mean vectors from two different populations and Σ is the pooled variance-covariance matrix (see, Johnson 1998, p.420 for further details). Note that Hotelling's T^2 is proportional to the Mahalanobis D^2 to measure the distance between two mean vectors μ_1 and μ_2. Therefore, Mahalanobis D^2 measure alone is sufficient to perform the multivariate analysis and test the difference between two mean vectors at a multidimensional level. Consequently, only Mahalanobis D^2 measure will be used in this paper for the assessment of separation or closeness of these countries economic/financial profiles.

Therefore, at the initial stage of our analysis Mahalanobis D^2 methodology will be used to observe the similarities and differences between these countries economic/financial profiles on the basis of multidimensional economic/financial factors collectively. Canonical discriminant analysis, a dimension reduction technique will then be used to classify countries that are grouped together and the group of countries that are separated from the other groups of countries. Thus, the countries those do not have the similar characteristics of core European Union countries on the basis of their economic/financial characteristics will be separated. Therefore, this technique classifies countries according to their economic/financial similarities and clusters them together into a group and at the same time keep them separated from other groups of countries that have dissimilar economies. The resulting clusters of countries should then exhibit high internal homogeneity and high external heterogeneity. Accordingly, if the classification is successful, countries within the cluster will be closer together in-terms of their economic situation and hence their bond ratings and countries between clusters will be economically distanced.

TABLE 2: Univariate and Multivariate Tests on Equality of Means

Univariate Test Statistics

Variable	Total Standard Deviation	Pooled Standard Deviation	Between Standard Deviation	R-Square	R-Square / (1-RSq)	F Value	Pr > F
GDP Growth Rate	4.5478	4.8237	1.4100	0.0933	0.1028	0.43	0.992
Current Account Balance % of GDP	7.0369	4.7959	5.6510	0.6256	1.6712	6.94	<.000
Inflation	2.5737	2.3205	1.5344	0.3448	0.5263	2.19	0.002
Public Debt % of GDP	31.3060	11.7565	29.9232	0.8863	7.7980	32.39	<.000
Unemployment Rate	3.7180	2.7458	2.8258	0.5604	1.2749	5.30	<.000
Budget Balance % of GDP	4.7884	3.7363	3.4695	0.5093	1.0379	4.31	<.000
Foreign Exchange % of CAB	2589	2691	942.8143	0.1287	0.1477	0.61	0.923

Multivariate Test Statistics and F Approximations

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.00079457	7.21	182	703.53	<.0001
Pillai's Trace	3.17385317	3.45	182	756	<.0001
Hotelling-Lawley Trace	35.87757008	19.79	182	512.16	<.0001
Roy's Greatest Root	26.25899803	109.08	26	108	<.0001

EMPIRICAL CLASSIFICATION FOR CREDIT QUALITY

This research examines the phenomenon of country classification in two different steps with the objective to identify countries debt rating status in terms of their economic profile. First, we have calculated the mean vectors of size seven for seven economic factors for each of the 27 different countries and their correlation matrix (results not reported) to identify possible similarities or differences between countries in-terms economic characteristics by using univariate analysis, along with other descriptive statistics (results not reported). These preliminary analyses encouraged us to perform multivariate analyses using Mahalanobis D^2 and Canonical Correlation. Analyses were done using SAS programming software and the results were reported in Table 1 and Table 3. Results show that Mahalanobis D^2 is consistently higher with Greece, Spain, and Italy. In addition, Estonia and Latvia also exerted some higher values on these Mahalanobis D^2 statistics. Therefore, the natural flow of analysis is to employ Canonical Discriminant Analysis using SAS to separate and cluster countries that are together according to their economic profile. Univariate mean comparison tests that are reported in Table 2 (top half) by economic factors reveal that five out of seven economic factors considered in this study are significantly differentiating country specific means with the most significant ones being Public Debt as % of GDP, Current Account Balance as % of GDP, and Unemployment rate with F statistics of 32.39 (p-value < 0.0001), 6.94 (p-value < 0.0001), and 5.30 (p-value < 0.0001) respectively. Country differences are found to be most widely separated according to their economic profiles by the first canonical function (Can1). Which is a linear combination of economic factors as follows: *0.0046122366 GDP growth rate + 0.1179516696 Current Account Balance − 0.2106353036 Inflation + 0.1379789893 Pub Debt −0.6145541125 Unemployment Rate + 0.1323753414 Budget Balance + 0.0000301329 Foreign Exchange Reserve* with a high R^2 of 0.981486 between this canonical variable and the country classification variable. First three canonical functions are highly statistically significant. However, the first two functions alone account for 93.55% of the total variability and the eigenvalues of these two functions are greater than one. Thus, we observe that these twenty seven countries means appear to fall into a two-dimensional subspace within the seven-dimensional space of economic factors. The estimated canonical variables are reported below:

CAN1 = 0.0046122366 GDP growth rate + 0.1179516696 Current Account Balance − 0.2106353036 Inflation + 0.1379789893 Pub Debt − 0.6145541125 Unemployment Rate + 0.1323753414 Budget Balance + 0.0000301329 Foreign Exchange Reserve

CAN2 = 0.0630444771*GDP growth rate* + 0.2802020199 *Current Account Balance* + 0.0150830575 *Inflation* − 0.0352378827 *Pub Debt* − 0.3520711461*Unemployment Rate* − 0.0581852053 *Budget Balance* + 0.0000100363 *Foreign Exchange Reserve.*

These canonical functions were then numerically calculated from the data (also known as z-scores, see Hair et. al., 1998, p.263) for each country and plotted in Graph-1 using SAS software to observe the clustered outcome of countries for the purpose of identifying countries that may lack capacity to pay their debt. This classification process identifies two different distinct cluster formations by the first canonical function. One formed by Greece and Italy and the other cluster formed by Spain, Latvia, and Estonia. Among these, Greece has been clearly separated by both canonical functions. This result is also supported by higher Mahalanobis D^2 as reported in Table 1. It is interesting to note that the first canonical variable which discriminates between above mentioned country groupings accounts for 73.19% of the total variation. Also note that the distance (or length) between clusters formed by the first canonical function (Can1) is much greater than the distance between clusters formed by the second canonical function (Can2) as can be seen with respect to axis (x and y) in Graph 1. However, second canonical function also formed another separation between Greece and others. This probably indicates that Greece's ability to pay and may also be willingness to pay their debt in jeopardy.

TABLE 3: Canonical Discriminant Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approximate Standard Error	Squared Canonical Correlation	Eigenvalues of Inv(E)*H = CanRsq/(1-CanRsq)			
					Eigenvalue	Difference	Proportion	Cumulative
1	0.981486	0.977164	0.003169	0.963315	26.2590	18.9560	0.7319	0.7319
2	0.937850	0.924399	0.010404	0.879562	7.3030	6.0823	0.2036	0.9355
3	0.741414	0.676123	0.038901	0.549694	1.2207	0.6569	0.0340	0.9695
4	0.600459	0.493193	0.055240	0.360551	0.5638	0.2030	0.0157	0.9852
5	0.514954	0.411145	0.063479	0.265178	0.3609	0.2477	0.0101	0.9953
6	0.318896	0.095434	0.077602	0.101695	0.1132	0.0563	0.0032	0.9984
7	0.232077	-.014453	0.081734	0.053860	0.0569		0.0016	1.0000

	Test of H0: The canonical correlations in the current row and all that follow are zero				
	Likelihood Ratio	**Approximate F Value**	**Num DF**	**Den DF**	**Pr > F**
1	0.00079457	7.21	182	703.53	<.0001
2	0.02165910	3.76	150	611.15	<.0001
3	0.17983566	1.80	120	516.02	<.0001
4	0.39936326	1.19	92	418.1	0.1356
5	0.62454235	0.82	66	317.4	0.8326
6	0.84992284	0.43	42	214	0.9991
7	0.94614022	0.31	20	108	0.9981

Raw Canonical Coefficients

Variable	Can1	Can2
GDP Rate	0.0046122366	0.0630444771
CAB % GDP	0.1179516696	0.2802020199
Inflation	-.2106353036	0.0150830575
Pub Debt % GDP	0.1379789893	-.0352378827
Unemployment Rate	-.6145541125	-.3520711461
Budget Balance % GDP	0.1323753414	-.0581852053
Foreign Exchange % CAB	0.0000301329	0.0000100363

DISCUSSION AND CONCLUSION

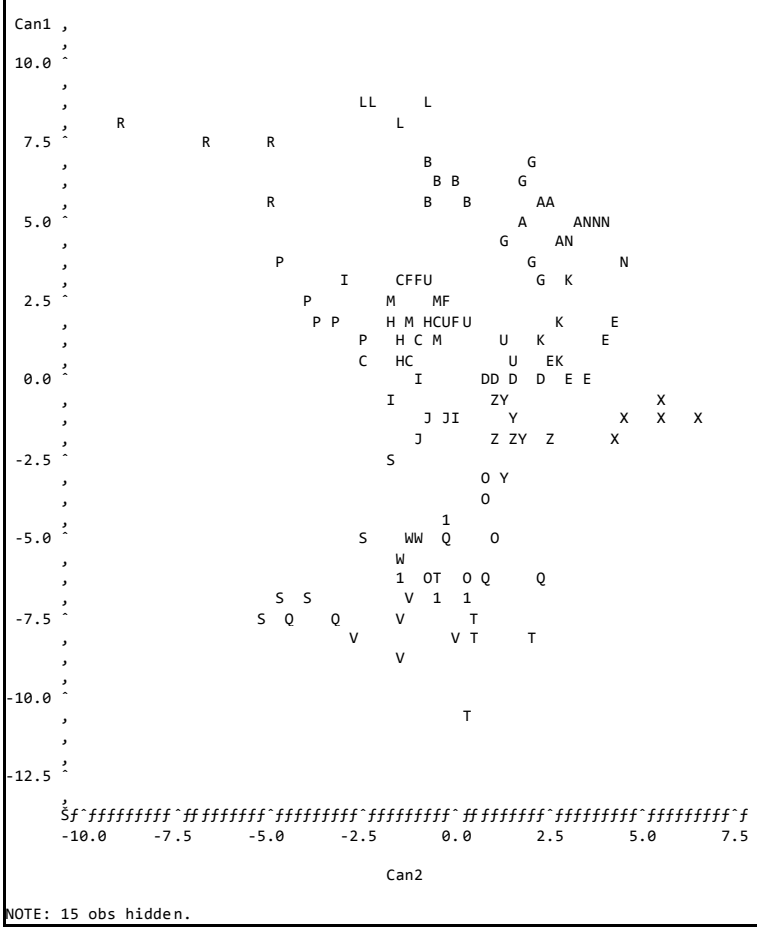
Adopting a common currency with single monetary policy without a commonly enforced fiscal discipline is found to be a flawed structure in recent years' financial crisis in the Eurozone. This strong currency policy in the Eurozone does not help economically weak member countries to compete effectively in the outside world. Growing dependence on external capital inflows to cover weaker countries rising trade imbalances can only make the country fiscally more unsound. Without an automatic punitive trigger, an economically weak country such as, Greece, Spain or Italy can get into a downward spiral without a proper recourse and can cause the bonds of currency union to burst. Therefore, this paper examined and compared the economic profiles of twenty seven Eurozone countries to observe how similar or dissimilar these countries are on the seven economic dimensions to identify countries' capacity to pay their debt.

This paper applied the classification and clustering methodology to economic data collected for 27 European countries. Multivariate analyses that included Mahalanobis D^2, canonical correlation, and canonical discriminant analysis revealed that Greece, Italy, and Spain have classified and separated from the other countries on the basis of seven economic factors that we have considered in this paper. In addition, Latvia and Estonia also classified as countries at the economically similar status of Spain and belongs to those that may lack the capacity to pay their debt. Thus, this analysis provides a diagnostics on the determinants of sovereign credit risk of the Eurozone countries from the perspective of lenders. Therefore, this study suggests that the Eurozone may like to rethink and redesign its economic union so as to foster an enduring harmony in their fiscal profiles. Specifically, if the policy makers concentrate on these economic factors and implement necessary policies that increase both capacity and willingness to pay debt then and only then the Eurozone may eventually achieve currency union and thus reduce sovereign credit risk.

There is currently a proposal to sell common Eurozone bonds (similar to US Treasury bonds). This idea is premature at this time as our analysis indicates that the credit quality is not uniform across all nations in the Eurozone. The fiscal disparity is too large between the weak and strong nations. It appears that a fiscal union is a necessary first step in that direction. The fiscal union will force the outlier nations, such as, Greece, Spain, and Italy to improve their fiscal strength. When the fiscal profiles of the weaker nations improve the Eurozone may be ready to float a common Eurozone bond issue.

GRAPH 1: Plot of Canonical Discriminant Functions.

Plot of Can1*Can2: Symbols are value of Country Code



EU-27 countries	Code
Austria	A
Belgium	B
Bulgaria	Q
Cyprus	C
Czech	Z
Denmark	K
Estonia	T
Finland	D
France	F
Germany	G
Greece	R
Hungary	H
Ireland	I
Italy	L
Latvia	V
Lithuania	1
Luxembourg	X
Malta	M
Netherlands	N
Poland	J
Portugal	P
Romania	O
Slovakia	W
Slovenia	Y
Spain	S
Sweden	E
UK	U

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