# ACADEMY of ECONOMICS and FINANCE

# PAPERS AND PROCEEDINGS

*55th*

**ANNUAL MEETING**

**HOUSTON, TEXAS**

**FEBRUARY 14-17, 2018**

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*Academy of Economics and Finance*

# Papers and Proceedings

Volume 42, 2018

Fifty-fifth Annual Meeting
Houston, TX
February 14-17, 2018

Program Arranged by Dr. Michael Toma
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# *Academy of Economics and Finance*

**Volume 42** **Papers and Proceedings** **2018**

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# *The Economic Impact of a Food Pantry in a Wealthy City*

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## Abstract

Newton, MA, is considered a relatively wealthy city. However, many residents in Newton face economic insecurity, including food insecurity. This study examines the economic impact of the Newton Food Pantry (NFP) on the residents it serves and the surrounding community. The results of this study provide insights into how organizations, such as food pantries, support not just the individuals and families they serve but the greater community in which they are located. The results can also guide policies and regulations that support programs such as food pantries as a means for increasing the economic security of all local residents.


## Introduction

By many measures, Newton, MA, is a relatively wealthy city. For example, the 2015 median income in Newton was nearly $127,000 while it was just under $71,000 for Massachusetts; the 2015 median housing value in Newton was $809,700 while it was $352,100 for Massachusetts (Onboard Informatics, 2017). However, there are many residents in Newton who face economic insecurity, including food insecurity; in 2015, 4.3% of the city's residents (roughly 4,000 people) were living at or below the poverty level (Onboard Informatics, 2017). This is not uncommon; several studies have documented pockets of economic insecurity in otherwise affluent or middle class areas (Greenberg, et al., 2010; Silver, et al., 2017).

Studies have also reported on the programs implemented to promote economic security and community development (Greenberg, et al., 2010; Greenwald and Zajfen, 2015; Morton, et al., 2005; Shanks and Harden, 2016; Silver, et al., 2017). This initial study begins the examination of the economic impact of one such initiative, the Newton Food Pantry (NFP), on the residents it serves as well as the surrounding community. Analysis of demographic and economic data collected from the American Community Survey as well as from communications with the pantry volunteers, serve as the basis for this initial assessment of the role of the pantry in the local economy.

The results of this study provide insights into further research that examines in more depth how organizations, such as food pantries, support not just the individuals and families they serve but the greater community in which they are located. In a time when the United States is struggling with increasing economic inequality, the findings provide further evidence that developing networks of organizations serving those facing economic insecurity can be part of an overall economic development plan for the community. The results can also guide elected officials and governmental agency staff in developing policies and regulations that support programs such as food pantries as a means for increasing the economic security of all local residents.

This paper reports the results of this initial study. It begins by discussing the NFP. Following that discussion are a review of literature regarding the impact of food pantries and other initiatives on local communities as well as demographic and economic analysis of Newton and its client base. The paper ends with a discussion of the initial results and plans for further study.

## The Newton Food Pantry

The Newton Food Pantry (NFP) is located in a central area of Newton, MA. It serves customers from the 13 villages of Newton as well as residents of nearby municipalities. This section provides a description of the pantry's current operations, its operational network and perspectives of its role in the community by volunteers and clients.

### *Operations*

The NFP began serving the community in 1983, brought into operation by one woman with a vision and a plan. With the help of a dedicated group of volunteers, the NFP gradually grew to address food insecurity issues faced by an increasing number of local residents. Today, more than 70 volunteers serve more than 700 residents of Newton (Cohen, 2017).





The pantry operates out of the basement of the Newton City Hall. This is a central location, accessible by public transit as well as foot and car. While the NFP does not have to pay for the space, no other direct funding from the city, state or federal government supports the pantry's operations. Private support, through financial and in-kind donations, is the only source of funds and other resources (Cohen, 2017; Newton Food Pantry, 2018a).

The NFP is a choice pantry that feels like a market; each visit clients, accompanied by a volunteer, select the items they want from those available on the shelves and in freezers and refrigerators. In addition to food items, personal care items, such as toilet paper and shampoo, and cleaning supplies are available (Cohen, 2017). Clients visit once a month during the school year; during the months of July and August, clients with children are allowed to visit twice a month. During the summer months, schools are not providing food support to the children; the NFP began to provide the additional visits to offset this loss of school meals to families. On each visit, clients are limited to certain amounts of items, depending on family size; these limits are summarized in Table 1 (personal emails with Tracie Longman on January 30, 2018 and Regina Wu on January 29, 2018). Estimates of the cost of each allotment are noted in parentheses within the table.

**Table 1:** Allotments by Food Category Per Visit (with estimated cost*)

| | Number in Household | | |
|---|---|---|---|
| **Items** | **1 – 2** | **3 – 4** | **Greater than 4** |
| ***Fruit and Vegetables*** | | | |
| Canned fruit | 2 cans/$2.00 | 3 cans/$3.00 | 4 cans/$4.00 |
| Canned vegetables | 2 cans/$3.00 | 5 cans/$5.00 | 6 cans/$6.00 |
| Fresh produce | 3 pounds/$4.50 | 4 pounds/$6.00 | 6 pounds/$9.00 |
| ***Protein*** | | | |
| Chicken | 5 pounds/$7.50 | 5 pounds/$7.50 | 5 pounds/$7.50 |
| Fish | 1 item/$3.00 | 1 item/$3.00 | 1 item/$3.00 |
| Other meat | 1 pound/$4.00 | 1 pound/$4.00 | 1 pound/$4.00 |
| Canned beans | 2 cans/$2.00 | 4 cans/$4.00 | 6 cans/$6.00 |
| Dry beans | 1 bag/$1.00 | 2 bags/$2.00 | 3 bags/$3.00 |
| Meals in a can | 2 cans/$3.00 | 4 cans/$6.00 | 6 cans/$9.00 |
| Peanut butter | 1 jar/$2.00 | 1 jar/$2.00 | 2 jars/$4.00 |
| Tuna | 3 cans/$3.75 | 4 cans/$5.00 | 5 cans/$6.25 |
| ***Dairy*** | | | |
| Eggs | 1 dozen/$2.00 | 1 dozen/$2.00 | 2 dozen/$4.00 |
| Fresh milk | 1 half-gallon/$2.00 | 1 half-gallon/$2.00 | 1 half-gallon/$2.00 |
| Shelf-stable milk | 1 box/$2.00 | 1 box/$2.00 | 2 boxes/$4.00 |
| Other dairy | 5 items/$4.00 | 9 items/$6.00 | 11 items/$7.00 |
| ***Other Food Items*** | | | |
| Canned soup | 4 cans/$3.00 | 5 cans/$3.75 | 7 cans/$5.25 |
| Canned tomatoes | 2 cans/$2.00 | 3 cans/$3.00 | 4 cans/$4.00 |
| Cereal/oatmeal | 1 box/$2.00 | 2 boxes/$4.00 | 3 boxes/$6.00 |
| Coffee/tea | 1 bag/$3.00 | 1 bag/$3.00 | 1 bag/$3.00 |
| Oil | 1 bottle/$1.00 | 1 bottle/$1.00 | 1 bottle/$1.00 |
| Jelly | 1 jar/$1.00 | 1 jar/$1.00 | 1 jar/$1.00 |
| Mac-and-cheese | 2 boxes/$3.00 | 3 boxes/$4.50 | 4 boxes/$6.00 |
| Miscellaneous | 3 items/$3.75 | 3 items/$3.75 | 3 items/$3.75 |
| Pasta/rice | 4 items/$3.00 | 6 items/$4.50 | 8 items/$6.00 |
| Tomato sauce | 2 jars/$2.00 | 3 jars/$3.00 | 4 jars/$4.00 |
| ***Toiletries*** | | | |
| Laundry detergent | 1 bottle/$3.00 | 1 bottle/$3.00 | 1 bottle/$3.00 |
| Toothpaste | 1 tube/$2.00 | 1 tube/$2.00 | 1 tube/$2.00 |
| Toilet paper | 1 package/$2.00 | 2 packages/$4.00 | 3 packages/$6.00 |
| Soap | 4 bars/$2.00 | 4 bars/$2.00 | 4 bars/$2.00 |
| Shampoo | 1 bottle/$1.00 | 1 bottle/$1.00 | 1 bottle/$1.00 |
| **Breads and Salads** | 2 pounds/$3.00 | 3 pounds/$4.50 | 5 pounds/$7.50 |
| **Total Value per Visit** | ***$82.50*** | ***$107.50*** | ***$144.25*** |

*Estimated cost based on observed prices for basic items at a local supermarket

During 2017, the NFP experienced growth in the number of clients it served. The number of households visiting the pantry increased by 16% over 2016. This included a 30 % increase in the number of adults, with a 3% increase in the number of seniors. In addition, there was an 8% increase in the number of children served (Newton Food Pantry, 2018b).

As a result of the increased number of clients, the pantry distributed 37% more total bags of food in 2017 over 2016; this followed an 11% increase in bags distributed from 2015 to 2016. In 2017, the bags contained on average 25 pounds of food each, with a total of nearly 16,400 bags distributed. In addition, the NFP expanded its holiday distribution of grocery gift cards by 47% from 2016 to 2017 (Newton Food Pantry, 2018b).

### *Network*

The NFP became a member agency of the Greater Boston Food Bank (GBFB) in 2010, allowing the pantry access to more types of food products such as fresh produce. During 2017, the NFP received 172,107 pounds of food from the GBFB; this was a 50% increase from 2016. This represented approximately 70% of the food and included 40% of the fresh produce distributed by the NFP in 2017 (Newton Food Pantry, 2018b).

Fresh produce is also supplied to the NFP through local vendors specializing in fresh produce as well as local farms during the growing season. Approximately 10% of the fresh produce is donated by local farms and community or individual gardens. Another 40% of the fresh produce is purchased at wholesale prices from local suppliers. In addition, the pantry has established relationships with organizations throughout Newton. Local bakeries, super markets and other food vendors regularly supply food to the pantry. Donations of food are accepted at any time and financial donations are used to purchase items not otherwise donated. The diversity of the offerings available to the clients has increased significantly in recent years (Cohen, 2017).

Based on its network, the pantry increased the amount of perishable and nonperishable items received and distributed by 27% between 2016 and 2017 (Newton Food Pantry, 2018b). This was accompanied by an increase in financial support through grants, donations from individuals and local partners, and additional community support (personal email with Tracie Longman on February 4, 2018). The financial implications of these increases are that the expenditures on food and non-food items grew along with the operating budget. In fact, from fiscal year 2013-2014 to fiscal year 2017-2018, the operating budget for the pantry more than doubled from just over $53,000 to nearly $112,000 (Newton Food Pantry, 2018b).

To reduce the amount of waste of donated and purchased perishable and nonperishable items, the NFP has established relationships with local organizations to which it distributes leftover perishable items on days when clients visit as well as nonperishable items the pantry does not have room to store. These organizations are primarily non-profits with locations serving low-income residents of Newton and neighboring localities, such as a woman's shelter and a local YMCA. These relationships help the NFP benefit more residents as it grows (Newton Food Pantry, 2018b).

### *Volunteers*

Volunteers fill all operational and managerial roles at the NFP. From stocking shelves to managing the volunteer schedule and finances to guiding clients on their visits, volunteers are key to the success of the pantry. In addition, volunteers pick up food from the organizations making food donations and deliver food and other items to clients unable to travel to the pantry on their own. A board of volunteers oversees the NFP's operations (Newton Food Pantry, 2018a).

Volunteers are involved with the pantry for various reasons. Many want to give back to the community. The author first became involved in the NFP for this reason. Other volunteers are also clients; these volunteers "work" for their food because it helps them overcome a sense of embarrassment about needing assistance. Further, many volunteers enjoy the social aspects of working at the pantry (Cohen, 2017).

### *Clients*

In 2017, the NFP served 721 clients. This included 240 children aged 17 and younger and 173 seniors aged 65 and over. The average number of households served was 322 per month, including 108 new households for 2017. The clients visit the pantry monthly (twice in the summer months for families with children), resulting in more than 8,600 visits during 2017. Of these visits, 2,855 benefited children and 2,071 benefited seniors (Newton Food Pantry, 2018b).

According to Tracie Longman, President of the Newton Food Pantry:

> *Despite its reputation as an affluent suburb of Newton, the number of people experiencing food insecurity in our city increases year after year. Those needing food assistance in our community include working parents, unemployed or underemployed adults, seniors, and many many children. We also have many*





> *immigrants needing food assistance including clients who speak Chinese, Russian and Spanish. (Newton Food Pantry, 2018b, p. 20)*

Clients often come to the pantry by referral from either the Newton Social Services Office or from other pantry clients. They provide basic information and show evidence of residency in Newton; no additional background checks or verification are required (Cohen, 2017). The founders of the NFP believed that most clients would not come to the pantry unless they needed the assistance; this perspective remains today (Hamilton, 2017).

In a recent article about the NFP, two clients shared their stories. One moved back to the area to care for aging parents, giving up a job to do so. He has not yet been able to find another job and has become a client of the pantry to makes ends meet. At first he felt ashamed to need such assistance, but has come to realize that there is no need to feel ashamed. Another client echoed the feeling being ashamed; she is an older client living on a fixed income and realized that she could no longer support herself without the assistance provided by the NFP (Cohen, 2017).

## Role of Food Pantries and Other Initiatives in Local Communities

The experiences of the NFP are not uncommon. Food insecurity is increasingly an issue in our environment of growing economic inequality. Over the last fifteen years or so, local initiatives to address food insecurity have been implemented in response to the growing need for food assistance. These include those in New Brunswick, NJ (Greenberg, et al., 2010), the state of Montana (Shanks and Harden, 2016) and Central Brooklyn, NY (Silver, et al., 2017).

Christ Church in New Brunswick, NJ, operates a food pantry; Greenberg, et al. (2010) report that during the three-year period from 2007 to 2010, the pantry saw an increase from 250 to 300 customers per month to 2,500 to 3,000. Results of a survey they conducted indicated that there were many reasons for people to seek out the pantry's services; often customers lacked adequate housing, had little or no access to health care and had obtained limited education. The church pantry at least provided some respite from the lack of access to food for these individuals and families.

Shanks and Harden (2016) focus on food insecurity among children in Montana; in 2012, 14.1% of households in Montana were food insecure. Lack of access to food is particularly concerning for children because of its effect on their physical, mental and emotional well-being. Communities had responded with food pantries and school-provided meals. One of the solutions has proven especially valuable: the Feeding America BackPack Program, which provides weekend food assistance to families with children. Started in 2008, this program or similar ones have been adopted throughout Montana and other regions in the United States. Based on their analysis of survey results, Shanks and Harden determined that these programs are successful in reaching children and reducing weekend hunger. With such success, children participating in the program exhibited fewer behavioral and emotional issues normally associated with lack of access to food. Programs that were most successful had significant community support and had adapted to local aspects, such as available food sources.

The Bedford Stuyvesant Restoration Corporation (BSRC) in Brooklyn, NY, as reported by Silver, et al. (2017), demonstrates what can be achieved when various initiatives and stakeholders come together to address food insecurity and other aspects of economic inequality. With the goal of giving young children access to healthier food, the BSRC also reduced some aspects of racial, ethnic and socioeconomic inequalities by building sustainable community-based economic development programs. Among the food-related activities were the creation of a partnership between the BSRC and local food organizations to bring local produce to retail outlets and institutional food programs and the establishment of a network of farmers' markets that directly connected local farmers with local food organizations to increase selection and reduce costs for fresh produce. The programs addressing food insecurity became the foundation on which other economic initiatives, including job training and employment opportunities, were built.

## Demographic and Economic Analysis of NFP Clients

The initiatives reported above show the range of possibilities when seeking solutions to reduce food insecurity. These initiatives indicate that food insecurity is tied to inadequate access to affordable housing and proper healthcare (Greenberg, et al., 2010; Shanks and Harden, 2016; Silver, et al. 2017). In addition, Greenwald and Zajfen (2015) suggest that immigration status is a factor in food insecurity. Food insecurity has also been linked to poverty and low-income employment (Greenberg, et al., 2010; Sliver, et al., 2017). These demographic and economic aspects were analyzed for the clients of the NFP to determine whether they also face these issues.

Demographics provided by the NFP are summarized in the Table 2 (Newton Food Pantry, 2018b, p. 16). These statistics suggest that the clients served by the NFP include a large proportion of immigrants. Families with children, families without children and single adults are equally represented among the NFP's clients. A large proportion of the clients are unemployed and a majority are receiving SNAP benefits. The last item suggests that the clients who are employed have low-income positions

that result in their living near or in poverty. These data bear out the findings of prior research: food insecurity is associated with other types of economic insecurity.

**Table 2**: Demographic Summary of NFP Clients

| Characteristic | Client Representation |
|---|---|
| ***Ethnicity*** | |
| Caucasian | 40% |
| Chinese | 20% |
| Russian | 20% |
| Latino | 10% |
| Other Asian | 5% |
| Black | 5% |
| Total | 100% |
| ***Household Status*** | |
| Families with children | 36% |
| Families without children | 30% |
| Single adults | 34% |
| Total | 100% |
| ***Other Characteristics*** | |
| Disabled adults | 5% |
| Estimated unemployed | 30% |
| Estimated on SNAP | 60% |

To conduct additional demographic and economic analysis, NFP 2017 clients' addresses were matched to their census tracts and blocks. American Community Survey 5-year 2016 estimates of demographic and economic factors for these blocks were analyzed. The factors for the blocks where clients live were compared to blocks in Newton where no clients were located to evaluate the differences. Only census tracts and blocks corresponding to Newton, MA were included because this is the service area for the NFP. Selected items are reported in Table 3.

**Table 3**: Comparison of Newton Food Pantry Client Census Block Information to Non-Client Census Blocks

| Factor | Client Block Average | | Non-Client |
|---|---|---|---|
| | *10 or more clients* | *1 to 9 clients* | Block Average |
| Percent, residents living below poverty level | 7.16 | 3.77 | 6.65 |
| Percent, families living below poverty level | 3.22 | 1.17 | 1.99 |
| Percent, income $25,000 or less | 15.49 | 6.94 | 8.97 |
| Percent, no wages or salaries | 22.77 | 20.15 | 18.41 |
| Percent, Social Security income | 28.69 | 27.12 | 24.81 |
| Percent, Supplemental Security Income | 4.32 | 2.68 | 2.55 |
| Percent, public assistance | 1.95 | 1.06 | 1.37 |
| Percent, renter-occupied housing | 42.06 | 29.57 | 41.47 |
| Percent, rent 50% or more of income | 18.88 | 23.55 | 11.90 |
| Percent, 18 and under without health insurance | 1.45 | 0.25 | 1.38 |
| Percent, 18 to 64 without health insurance | 3.43 | 2.26 | 2.06 |
| Percent, 65 and over without health insurance | 0.34 | 0.54 | 0.21 |

The client blocks are divided into two groups: those with a high number of clients served (10 or more) and those with a low number of clients served (1 to 9) by the pantry. As indicated in the table, there are differences between the blocks depending on the number of clients served (10 or more, 1 to 9, or none). Blocks where a larger number of NFP clients live have higher levels of poverty and benefit more from public programs, such as supplemental security income and public assistance, than blocks were few or no NFP clients live. Those same blocks have more residents living with no or low income. In all blocks where NFP clients live, renter-occupied housing is higher and rent required more of the household's monthly income than in blocks where NFP clients do not live. Lastly, in blocks where a larger number of NFP clients live, children and adults between the ages of 18 and 64 are more likely to not have health insurance, which suggests that they have lower access to quality health care than residents of blocks where few or no NFP clients live.





These preliminary data indicate that the clients served by the NFP are similar to those documented in other research. They are more likely to be immigrants, have low or no income, be receiving governmental assistance, have expensive housing, and have less access to health care.

## Implications of Analysis and Further Study

The direct benefits to NFP clients are estimated in Table 1. With each visit, households of 1 to 2 individuals receive $82.50 in food and personal items, households of 3 to 4 individuals receive $107.50 in food and personal items, households with more than 4 individuals receive $144.25 in food and personal items. In summer months, these benefits are doubled for households with children. For households living in or near poverty, these benefits free up limited resources for other necessary expenses, such as rent or utilities payments.

The financial implications are broader, though. When these households have additional resources, they spend additional amounts in the local community. It might be that they now pay the rent to the landlord or the electricity bill to the electric company. They may also buy clothing and educational supplies that they might have foregone without the additional financial resources freed up by receiving food and personal items from the pantry. These households can also use public assistance benefits to buy healthier food because the basics are supplied by the pantry. All of these possibilities suggest that households gain a small amount of economic security and share some of that financial benefit with the local economy. The financial impact of the NFP is broadened outside the households.

Examples of additional economic benefits are provided through the network within which the NFP operates. Food that might otherwise have been thrown away is kept out of landfills. An estimated total of 410,000 pounds (16,400 bags at 25 pounds per bag) of food and personal items were distributed in 2017; while some of these items were purchased by the NFP, a large portion was donated from vendors unable to sell the products. The network also increases the diversity of the items available to the clients, including better access to fresh produce. This can provide additional health benefits to the clients that may result in lower demands on clinics and other healthcare outlets. The network allows the NFP to share the food and personal items it cannot use with other local organizations, which benefit additional residents as well as helping other local non-profits better serve their communities.

Further study, however, is required to determine the nature of the broader economic benefits to the community. The initial findings suggest possible avenues for that research. The flow of resources through the NFP network could be more closely evaluated. How clients use their freed-up financial resources could be traced. The additional research would better inform elected officials and governmental agency staff in developing policies and regulations that support programs such as food pantries as a means for increasing the economic security of all local residents.

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# *Finance in the Cinema: A Survey of Professor Ratings of Movies for Finance Students*

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## Abstract

*This study reports and discusses the results of a survey of members of the Financial Education Association regarding their ratings of 30 movies for use with finance students. The survey results also include additional recommended movies and respondents' comments regarding whether and how they utilize movies and excerpts in their finance classes.*

Teaching finance and other business disciplines poses the continuous challenge of linking the wide variety of theories to the "real world" and providing students with an organizational frame of reference that helps them understand and appreciate the relevance and context within which the subject matter applies. It is also challenging to include the human dimensions of our disciplines. It is ultimately men and women who practice finance, people who are motivated by egos, desire for career success, lust, money, job security, excitement, competition, greed, and power.

We have found that movies and short excerpts from movies (film clips) can be used to bring finance and other business subjects alive in ways that that are difficult to achieve in traditional lectures and assignments. Used properly, movies or film clips can help student place learning in a broader richer context. While movies are not a substitute for traditional pedagogical tools, the complexity and richness found in the script and in the acting offers professors a way to recreate ethical dilemmas that reflect situations students may face one day.

Movies can help make abstract concepts, such as agency theory, corporate culture, and corporate governance, more compelling and real. It is difficult to imagine that young undergraduate students, with little or no business experience, especially at the managerial level, can appreciate the relevance and application of these and other finance topics outside of their organizational context. In his article discussing the use of the movie Wall Street in the classroom, Dyl (1991) described movies as "live cases."

Serey (1992), who uses the movie Dead Poet's Society to teach management and organizational behavior, points out that students prefer visualization over passive learning techniques and that the characters and plots dramatized in movies help students gain a deeper understanding of topics and their applications and relevance to the real world (at least as depicted in movies).

The list of Hollywood movies with finance and business themes has grown over the years. Some are well-known and award winning. Others are less well known, but nonetheless valuable in terms of the insights and lessons they provide. Some chronicle corporate takeovers, bankruptcies or the global financial crisis; others focus upon the unethical and fraudulent behavior of individuals. Some are fictional and others are documentaries.

There is also a growing literature on the use of movies in the finance classroom. This includes articles by Dyl [1991], Beldon [1992], Chan, Weber and Johnson [1995], Graham and Kocher [1995] Nofsinger [1995], Peterson and Philpot [1997], Fairchild and Grayson [2004], Philpot and Ogelsby [2005], Hatfield and Buchko [2008], Kester, Cooper, Dean, Gianiodis, and Goldsby [2012], and Kester [2013], Goebel, Athavale and Weber (2016), Assad (2016), and Kester (forthcoming).

In this study we develop an annotated bibliography of 30 movies with finance themes and report the results of a survey of members of the Financial Education Association regarding their ratings of the movies. Our survey also solicited recommendations regarding other movies or excerpts and included questions regarding whether respondents used movies or films in their classrooms.

Our results should be of interest to readers who may be considering the use of movies or excerpts in their finance classes, either for in-class viewing or assigned for student viewing outside of class. At a minimum, our results should be of interest to readers who are looking a good movie to watch at home.

## The Movies

The 30 movies in our survey include 26 movies discussed by Goebel et al. (2016). We have summarized each film briefly here. They are listed in alphabetical order.

1. *Barbarians at the Gate* (1993, 107 minutes). Based on the bestselling book of the same title by Burrough and Helyar (1990), this movie chronicles the history of RJR Nabisco from its beginning in 1875 as RJ Reynolds Tobacco Company to its





numerous food company acquisitions in the 1970s and 1980s to the well-publicized takeover battle and leveraged buyout of the company in 1988. The use of *Barbarians at the Gate* to discuss issues related to valuation, ethics, agency theory, leveraged buyouts and social responsibility is discussed by Nofsinger (1995), Peterson and Philpot (1997), Kester et al. (2012), and Goebel et al. (2016). Kester (2008) discusses how the movie can be combined with Burrough's and Helyar's (1991) book, a Harvard Business School case that focuses on the valuations of RJR Nabisco, and articles in the popular press to provide students with a multidisciplinary perspective into the one of the largest leveraged buyouts in history.

2. *Boiler Room* (2000, 120 minutes). This movie, discussed by Kester et al. (2012) and Goebel et al. (2016), focuses upon the world of aggressive and unethical stock brokerage firms. It tells the story of a young stockbroker who learns how to call prospects and use aggressive tactics to generate clients. He learns that the firm's business is based on a "pump and dump" scam.

3. *Brewster's Millions* (1985, 100 minutes). Based on a novel by George Barr McCutcheon (1902), this movie tells the story of a man whose uncles dies and leaves him his substantial estate, but with various conditions. He can either take $1 million or spend $30 million over 30 days to receive $300 million. There are various stipulations on how he can spend the $30 million, including a limit on the amount he can donate to charity. He cannot tell anyone about the arrangement. See Goebel et al. (2016) for a description and discussion questions related to the 1945 version of the film which has been presented in seven film adaptations.

4. *The Bank* (2001, 106 minutes). An Australian thriller, *The Bank* tells the story of a mathematician who devises a method to predict movements in the stock market. He joins a bank that uses his computer program to make a large trade, but with devastating results. See Goebel et al. (2016).

5. *The Big Short* (2015, 130 minutes). This Academy Award-winning movie, based on the best-selling book of the same title by author Michael Lewis (2010), consists of three storylines about investors who correctly predicted and profited substantially from the collapse of the housing market in 2008.

6. *Company Men* (2010, 113 minutes). This movie tells the story of three executives who are laid off and their struggles with unemployment. Goebel et al. (2016) provides several useful discussion questions.

7. *The Corporation* (2003, 145 minutes). This Canadian documentary, written by Joel Bakan, a University of British Columbia law professor, explores the development of the modern corporation as a separate legal entity. See Goebel et al. (2016).

8. *Enron: The Smartest Guys in the Room* (2005, 110 minutes). This academy award-nominated documentary based on the best-selling book by McLean and Elkind (2003), chronicles the demise of Enron Corporation. Its use in the classroom is discussed by Hatfield and Buchko (2008), Kester et al. (2012), and Goebel et al. (2016).

9. *Glengarry Glen Ross* (1992, 100 minutes). This critically-acclaimed movie, described by Kester et al. (2012) and Goebel et al. (2016), focuses upon the lives of four real estate agents over two days as they respond to the company's attempts to motivate sales by announcing all but two of the salesmen will be fired within a week. The movie is based on the Pulitzer Prize and Tony Award-winning play by David Mamet.

10. *Heist: Who Stole the American Dream* (2011, 90 minutes). This is a documentary that explores the causes of the global financial crisis, including deregulation and free trade agreements.

11. *Inside Job* (2010, 109 minutes). This Academy Award-winning documentary chronicles how changes in the regulatory environment and banking practices led to the bubble in housing prices, the bankruptcy of Lehman Brothers and near-collapse of the financial system. It is divided into five parts: I. How We Got Here, II. The Bubble (2001-2007), III. The Crisis, IV. Accountability, and V. Where We Are Now. Use of the movie in the classroom and related discussion questions is discussed by Goebel et al. (2016) and Kester (forthcoming).

12. *The International* (2009, 118 minutes). This international thriller follows an Interpol agent and American district attorney who investigate a Luxembourg bank's funding of arms trading, money laundering, and terrorism. See Goebel et al. (2016).

13. *IOUSA* (2008, 85 minutes). This film, described by Goebel et al. (2016), is a documentary that focuses on the U.S. national debt. The film follows David Walker, the former U.S. Comptroller General, as he travels around the country to let people know (Fiscal Wake-Up Tour) about the problems associated with increasing deficits.

14. *It's a Wonderful Life* (1946, 135 minutes). The use of this popular and well-known holiday favorite in the finance classroom is discussed by Philpot and Ogelsby (2005) and Goebel et al. (2016). The movie tells the story of an angel sent to show a despondent building and loan company owner what life would have been like if he had never been born.

15. *Margin Call* (2011, 109 minutes). This Academy Award-nominated movie focuses on a 36-hour period at a large fictional investment bank in the early stage of the 2008 financial meltdown. See Goebel et al. (2016) for discussion questions related to *Margin Call*.

16. *Other People's Money* (1991, 101 minutes). Originally an off-Broadway comedy by Jerry Steiner, this movie portrays the hostile takeover of New England Wire & Cable by corporate raider Garfield Industries. The story culminates in a proxy fight with impassioned and memorable speeches at the company's annual shareholders' meeting. It is a story that combines

colorful personalities, greed, comedy and romance. The use of the movie as a case study of corporate restructuring, ethics, social responsibility and corporate takeovers is discussed by Chan et al. (1995), Graham and Kocher (1995), Kester et al. (2012), and Goebel et al. (2016).

17. *The Pursuit of Happyness* (2006, 117 minutes). This Academy Award-nominated biographical drama tells the story of an out-of-work and homeless salesman who becomes an unpaid intern and subsequently a highly successful stockbroker with Dean Witter Reynolds. See Goebel et al. (2016).

18. *The Queen of Versailles* (2012, 100 minutes). This documentary focuses upon the owners of Westgate Resorts as they build their private mansion, one of the largest and most expensive homes in the United States, and the challenges and crisis they face from the collapse of housing prices and 2008 financial crisis.

19. *Repo Men* (2010, 111 minutes). This science fiction film, set in the future, portrays an organization that repossessing artificial organs from recipients who have defaulted in their payments. See Goebel et al. (2016) for discussion questions.

20. *Rogue Trader* (1999, 102 minutes). This movie, discussed by Kester et al. (2012) and Goebel et al. (2016) is a dramatization of how futures trader Nick Leeson brought down 200-year old Barings Bank, the worlds' first merchant bank. The movie is based on Leeson and Whitley"s (1996) book, *Rogue Trader: How I Brought Down Barings Bank and Shook the Financial World*.

21. *Rollover* (1981, 118 minutes). This political thriller tells the story of a former film star who inherits her husband's company after he is murdered. Teaming up with a banker who helps her secure financing in Saudi Arabia, they discover a plot by an Arab company to destabilize the West. See Goebel et al. (2016).

22. *The Secret of My Success* (1987, 111 minutes). A recent college graduate, who travels to New York for a finance job, learns that his job has been eliminated. He finds a job working in the mailroom for a company run by his uncle. He poses as an executive for the company and eventually ends up as CEO. See Goebel et al. (2016).

23. *There Will Be Blood* (2007, 158 minutes). This Academy-award winning movie follows the life of an oilman in his ruthless quest for wealth during Southern California's oil boom. See Goebel et al. (2016).

24. *Too Big to Fail* (2011, 98 minutes). Based on Andrew Ross Sorkin's (2009) multiple-award winning book of the same title, this movie dramatizes the events leading to the bankruptcy of Lehman Brothers, the acquisition of Merrill Lynch by Bank of America, the bailout of AIG, the creation of the Troubled Asset Relief Program (TARP), and the U.S. Government capital injections into the largest banks. The movie focuses on the decisions of U.S. Secretary of the Treasury Henry Paulson. The use of *Too Big to Fail* in the classroom along with discussion questions to help students understand the events leading to the global financial crisis is discussed by Goebel et al. (2016) and Kester (forthcoming).

25. *Trading Places* (1983, 116 minutes). This well-known movie tells the story of a homeless street hustler and privileged commodities broker who unwittingly became part of wager between two brothers, owners of a commodities brokerage firm, who debate whether genetics or environment is the primary factor affecting human success. They conduct an experiment by switching the lives of the privileged broker and the street hustler. See Goebel et al. (2016) for related discussion questions.

26. *Trillion Dollar Bet* (2000, 48 minutes). This documentary chronicles the rise and fall of the hedge fund Long Term Capital Management founded by Nobel Laureate Myron Scholes and others. Its use in the classroom is discussed by Fairchild and Grayson (2004).

27. *Wall Street* (1987, 125 minutes). This well-known Academy Award-winning movie is the story of a young ambitious stockbroker who divulges inside information to unscrupulous corporate raider, the infamous Gorden Gekko, who has become synonymous with the phrase "greed is good." The use of *Wall Street* as a springboard for classroom discussion of insider trading and ethics is discussed by Dyl (1991), Beldon (1992), Kester et al. (2012), and Goebel et al. (2016).

28. *Wall Street: Money Never Sleeps* (2010, 136 minutes). This sequel to the original movie portrays Gordon Gekko after he leaves prison for insider trading. He tries to establish a relationship with his daughter, but ends up back to his old tricks. See Goebel et al. (2016).

29. *The Wolf of Wall Street* (2013, 179 minutes). Based on the 2007 memoir of Jordan Belfort, this Academy Award-nominated movie chronicles his rise on Wall Street to founding his own firm, Stratton Oakmont, and defrauding wealthy clients out of millions while at the same time living a wild life of parties, sex and drugs. See Goebel et al. (2016) for discussion questions.

30. *Working Girl* (1988, 116 minutes). A smart secretary, Tess, who works in mergers and acquisitions department of an investment bank and has been taking business courses at night, makes an excellent suggestion regarding a merger for one of the firm's clients to her boss, who successfully implements it without giving due credit to Tess. See Goebel et al. (2016) for discussion questions.





## Survey of Faculty Ratings

To obtain faculty ratings of these 30 movies, we used email and SurveyMonkey to survey 334 members of the Financial Education Association. We asked the respondents to rate each book using a four-point scale of 1 = not recommended, 2 = weakly recommended, 3 = recommended, and 4 = highly recommended. Respondents who had not seen a particular movie were asked to indicate 0 = no opinion. Our list of movies is certainly not all-inclusive. Therefore, our questionnaire also solicited other recommended movies from the survey respondents.

The questionnaire did not ask respondents to identify themselves or their universities. It was emailed on June 1, 2017, and we received 41 responses initially. Complete second and third emailings were subsequently conducted to improve the response rate. In total, we received 80 responses, an overall response rate of 24 percent.

Our cover letter email accompanying the questionnaire is shown in the Appendix.

## Results

Table 1 contains the results of our survey, including the weighted-average mean rating of each movie along with the number of respondents who rated each movie using the scale of 1 to 4. The 30 movies listed in Table 1 are ranked according to the mean rating.

The top ranked movie was – the envelope please -- *The Big Short*, which was followed by *Trillion Dollar Bet*, *Too Big to Fail*, *Barbarians at the Gate*, and *Enron: The Smartest Guys in the Room*. The movie with the lowest rating among our list of 30 movies was *Working Girl*.

Not surprisingly, movies that were popular with audiences and received high ratings from critics were not necessarily rated highly for the financial education merit by the respondents of our survey. For example, *The Wolf of Wall Street* and *There Will Be Blood* had low ratings in our survey but received high ratings by critics (77 percent and 91 percent, respectively, by Rotten Tomatoes, a website that aggregates reviews from film critics). *Working Girl*, ranked last by our respondents, received a Rotten Tomatoes rating of 84 percent. Conversely, *Rogue Trader*, ranked eighth by the respondents of our survey for its education merit, only received a Rotten Tomatoes rating of 30 percent.

When ranked according to the number of respondents who rated the movies, which may reflect how widely-viewed the movies have been by the respondents, the most frequently rated movie was *It's a Wonderful Life*, followed by *Trading Places* and *Wall Street*. This result is not surprising given the general popularly of these classics.

In addition to rating the 30 movies, respondents were given an opportunity to provide comments about each movie. The results, listed in the Table 2, are quite varied. On balance, their comments are positive and focus on the educational benefits of the movies. However, some respondents questioned the academic content and relevance of some of the movies and expressed concerns regarding profanity and nudity in others. One respondent commented that the movie *Wall Street* "overemphasized 'the bad aspects' of finance" and another said that *The Corporation* was "too one-sided for the classroom." Needless to say, instructors should guard against movies presenting distorted or biased views of finance, while at the same time acknowledging that there are numerous examples of bad behavior by people in finance.

Beyond the 30 movies listed in the questionnaire, the respondents were asked to suggest other movies and video presentations that they would recommend to finance students. Their recommendations are listed in Table 3. They include additional movies and documentaries, *Ted Talk* videos, documentaries presented on PBS *Frontline*, and various television series.

We next asked respondents if they used movies (or excerpts) in their classes. In response to this question, 52 percent of the respondents answered "yes." The remaining 48 percent answered "no." For those who answered "yes" we asked them to "please list the courses and movies used and whether movies are shown during class or viewed outside of class time." The results, shown in Table 4, provide interesting and diverse examples of how the respondents use movies and excerpts to enhance their student financial education in various finance courses.

It is important to note the limitations of this research and our results. Firstly, there is probably response bias in our results. We surveyed members of the Financial Education Association, individuals who presumably have a special interest in teaching and financial education and who may therefore be more likely to employ more innovative teaching techniques in their classrooms. Therefore, it would be problematic to extrapolate our results to the broader academic community.

In few cases, respondents commented that it had been a long time since they had viewed a particular movie.

As previously acknowledged, the data presented in Table 1 is based on the particular movies that we selected for the survey. As indicated by the number of ratings shown in Table 1, none of the movies were rated by all 80 respondents. Six of the movies, *IOUSA*, *Heist: Who Stole the American Dream*, *The Queen of Versailles*, *Rollover*, *The International*, and *The Bank* were rated by fewer than ten respondents. This limits the comparability of the ratings.

**Table 1:** Survey Results
Faculty Ratings of Recommended Movies in Finance
Ranked According to Mean Rating*

| Movie | Number of Ratings | Percentage of Responses Within Each Rating** | | | | Mean*** |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| *The Big Short* | 61 | 1.6% | 3.3% | 29.5% | 65.6% | 3.59 |
| *Trillion Dollar Bet* | 28 | 0.0% | 7.1% | 42.9% | 50.0% | 3.43 |
| *Too Big to Fail* | 49 | 2.0% | 16.3% | 36.7% | 44.9% | 3.24 |
| *Barbarians at the Gate* | 48 | 2.1% | 16.7% | 47.9% | 33.3% | 3.13 |
| *Enron: The Smartest Guys in the Room* | 54 | 1.9% | 20.4% | 42.6% | 35.2% | 3.11 |
| *Trading Places* | 63 | 9.5% | 19.0% | 31.7% | 39.7% | 3.02 |
| *Inside Job* | 28 | 7.1% | 17.9% | 42.9% | 32.1% | 3.00 |
| *Rogue Trader* | 25 | 4.0% | 28.0% | 32.0% | 36.0% | 3.00 |
| *Wall Street* | 63 | 11.1% | 15.9% | 36.5% | 36.5% | 2.98 |
| *Other People's Money* | 36 | 16.7% | 19.4% | 19.4% | 44.4% | 2.92 |
| *The Corporation* | 10 | 10.0% | 10.0% | 60.0% | 20.0% | 2.90 |
| *Margin Call* | 35 | 5.7% | 31.4% | 37.1% | 25.7% | 2.83 |
| *The International* | 8 | 12.5% | 25.0% | 37.5% | 25.0% | 2.75 |
| *IOUSA* | 9 | 22.2% | 11.1% | 44.4% | 22.2% | 2.67 |
| *It's a Wonderful Life* | 66 | 12.1% | 37.9% | 24.2% | 25.8% | 2.64 |
| *The Pursuit of Happyness* | 31 | 16.1% | 32.3% | 29.0% | 22.6% | 2.58 |
| *Heist: Who Stole the American Dream?* | 9 | 22.2% | 11.1% | 55.6% | 11.1% | 2.56 |
| *Boiler Room* | 34 | 8.8% | 44.1% | 32.4% | 14.7% | 2.53 |
| *The Bank* | 4 | 0.0% | 50.0% | 50.0% | 0.0% | 2.50 |
| *Glengarry Glen Ross* | 30 | 23.3% | 40.0% | 20.0% | 16.7% | 2.30 |
| *Company Men* | 10 | 20.0% | 30.0% | 50.0% | 0.0% | 2.30 |
| *Wall Street: Money Never Sleeps* | 35 | 20.0% | 42.9% | 28.6% | 8.6% | 2.26 |
| *The Queen of Versailles* | 9 | 22.2% | 33.3% | 44.4% | 0.0% | 2.22 |
| *The Wolf of Wall Street* | 54 | 33.3% | 29.6% | 25.9% | 11.1% | 2.15 |
| *Brewster's Millions* | 26 | 42.3% | 26.9% | 19.2% | 11.5% | 2.00 |
| *There Will Be Blood* | 21 | 28.6% | 52.4% | 9.5% | 9.5% | 2.00 |
| *Repo Men* | 14 | 42.9% | 14.3% | 42.9% | 0.0% | 2.00 |
| *The Secret of my Success* | 26 | 23.1% | 57.7% | 19.2% | 0.0% | 1.96 |
| *Rollover* | 9 | 33.3% | 44.4% | 22.2% | 0.0% | 1.89 |
| *Working Girl* | 38 | 36.8% | 42.1% | 21.1% | 0.0% | 1.84 |

*Respondents were asked to rate each movie on a scale of 1 to 4, where 1 = not recommended, 2 = mildly recommended, 3 = recommended and 4 = highly recommended. Respondents who had not seen the movie or chose not to rate it were asked to enter 0 = no opinion

**The percentage of responses within each rating are calculated based upon the ratings of those respondents who rated the movies with a rating of 1 to 4.

***The mean ratings are calculated by multiplying the percentage of responses in each rating category with values of 1 through 4.





## Concluding Comment

Notwithstanding the limitations of our research, we believe that our results should be of interest to colleagues who are looking for good finance movies to view themselves, use in the classroom, and/or to recommend to their students. Movies (and excerpts) help bring finance alive in ways that journal articles, textbooks, lecture and cases cannot easily achieve and therefore enhance the understanding and application of our discipline.

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## Appendix

### Cover Letter for Faculty Survey

*Dear Finance Colleagues:*

*Teaching finance and other business disciplines poses the continuous challenge of linking the wide variety of theories to the "real world" and providing students with an organizational frame of reference that helps them understand and appreciate the relevance and context within which the subject matter applies. It is also challenging to include the human dimensions of our disciplines.*

*We have found that movies and short excerpts from movies (film clips) can be used to bring finance and other business subjects alive in ways that that are difficult to achieve in traditional lectures and assignments.*

The list of Hollywood movies with finance and business themes has grown over the years. Some are well known and award-winning. Some chronicle corporate takeovers, bankruptcies, and the global financial crisis; others focus upon the unethical and fraudulent behavior of individuals. Some are fictional and others are documentaries.

We would greatly appreciate your input. Our questionnaire contains a list of 30 movies that we have recommended to our finance students over the years. In some cases, we incorporate the movies into our finance courses. We are interested in your ratings of these movies. If you have not seen a particular movie, simply indicate "no opinion."

Our questionnaire provides you with an opportunity to list other movies that you would recommend to finance students. It also solicits your experience, if any, integrating movies into your courses. We would like to include these in the results of our research study.

We plan to present the results of the survey at the Financial Education Association/Academy of Business Education 2017 Conference. Please be assured, however, that the survey is anonymous and does not solicit any information identifying you or your university. To take the survey, please go to the following link: https://www.surveymonkey.com/r/FEAMovies

Thank you in advance,

(Signed by coauthors with titles and affiliations)

**Table 2:** Survey Results
Respondents' Comments About 30 Movies

*1. Barbarians at the Gate*

Dated, but a good account of one of the deals that opened our eyes to the possibilities that mega-deals represented. Plus, KKR is still around and still a major player.

A good educational piece on management leveraged buyout.

Use with HBS case.

I assigned this movie within a general finance course (e.g., required for accounting, finance, marketing, and management majors). Students gave this high ratings.

Another good historical piece that explains the LBO process as well as corporate governance. The comedy can be a little distracting, and the abundance of profanity in the film is also problematic.

Good story.

*2. Boiler Room*

Good but overdone -- makes students think all finance is like this.

First two-thirds are good. Falls apart at the end.





*3. Brewster's Millions*

Would this have any academic financial content?

*4. The Bank*

I assigned this movie once in a general undergraduate finance course servicing a variety of business and nonbusiness majors.

*5. The Big Short*

I especially like the "Jenga" clip.

Don't care too much about Hollywood sensationalism but it's a good educational piece about how much the financial system can go wrong. The book is better though. Overdone but interesting....have students research the events leading up to the movie...high interest rates and failures of savings and loans....moral hazards of creating government secondary mortgage market .... congressional finance committee under Barney Franks directing banks to make subprime loans and Fannie Mae to buy them....bank redlining regulations....housing becomes an investment rather than consumption....Fed leaving interest rates too low for too long stimulating the housing bubble...etc.

Anything that Michael Lewis writes going to film is worth a look.

Sex scene makes it impossible to use in class under school rules. GP version needed for class usage.

Excellent movie to show in finance classes! I've shown two semesters in a row and students really appreciated it!

The best, brief descriptions of some technical elements.

I assigned this movie in a recent undergraduate finance class, consisting solely of majors. This was in addition to a PBS movie via our university library.

The book was much better.

Superb. Educational.

*6. Company Men*

I have not seen this movie. However, I believe that it could help frame the shareholder vs. stakeholder debate. And it may also be useful in a personal finance class to discuss work/life balance and living within one's means.

*7. The Corporation*

Some of the clips can help spur a discussion on the shareholder theory of the firm.

Too one-sided for a classroom?

This movie was very well received in an undergraduate class consisting of finance majors (seniors), particularly those who had secured internships the previous year at large firms.

*8. Enron: The Smartest Guys in the Room*

Good for discussions on corporate culture.

Is Enron common or does it represent an exception? Sarbanes Oxley likely has cost more in compliance than the savings to society – a good discussion question.

Proof that intelligence and ethics don't necessarily go hand in hand.

This is recommended, rather than highly recommend, but I didn't find good parts to use. I would not want to take a class period to view the movie. I have used this as an extracurricular event.

I assigned this movie within a general finance course (e.g., required for accounting, finance, marketing, and management majors). Students gave this high ratings.

*9. Glengarry Glen Ross*

I used to show the "motivational" scene at the beginning of the film to acquaint students with the pressures of having a "real" job. Unfortunately, there are several words used that are not politically correct and so younger students have a hard time getting past that point.

Another great movie, more to do with sales than finance.

A very slow and boring film to address a simple point of ethics.

A good look at how intense the pressure can be in the sales field.

Saw it but thought it was a little slow. But, that was also before I was a finance professor.

This is more for organizational behavior than finance.

Lots of profanity, if I remember correctly. Maybe my memory is wrong.

This is both educational about this industry and thoughtful.

*10. Heist: Who Stole the American Dream*

No comments.

*11. Inside Job*

There are good info-graphics to explain complicated topics.

Excellent.

Haven't used this, but it looks good.

*12. The International*

No comments.

*13. IOUSA*

Note the date. The problem was about to get worse.

*14. It's a Wonderful Life*

There's a recent article in *The Atlantic* that touches on the moralities of banking.

I've used this effectively in a commercial banking class to show the popular media portrayal of bankers and the incomplete understanding of risk that many in society have (with respect to the savings and loan component).

It's just a great movie, not strongly tied to finance.





Are there any movies showing business people in a positive light?

A classic.

Saw a long time ago; do not remember the relevance for finance.

Good to show why MBS are important.

I assigned this movie to students in a seminar servicing a variety of majors. It was well-received.

This one is a good piece about deposit institution regulation, operations and history. The bank run scene in particular is a good illustration that leads into the reason for the FDIC. The film does have several inaccuracies (e.g., George will NOT go to jail over the lost currency) and a slightly anti-capitalist slant. These can also be pointed out to students. The film can be separately used for ethics.

Excerpts only. Two out of 30 have seen. Great movie. Money and Banking better fit.

Well done movie. Emotionally satisfying. But the financial knowledge is high school level.

*15. Margin Call*

Really bad from an entertainment standpoint and not real finance (at least not that I noticed. It was hard to watch).

I assigned this movie in a required MBA finance class servicing all MBA students. It was well received.

*16. Other People's Money*

I have used this film in my MBA Corporate Finance course for at least 15 years now, and in my advanced finance course as well. I use the chalkboard scene to illustrate how valuation works, and I use the two addresses to the voting shareholders to highlight that both speakers have valid points to make. I use at least those two scenes, but I have also used the whole film.

The movie not only tells the detailed story of a corporate takeover but also presents the dilemma of making a profit versus taking care of company's employees.

Two articles were published in FPE on how we can use the movie in the classroom.
It is a good opportunity to compare the ugly side (the movie) to the good side of driving inefficiencies out of the market. What is wrong with resources seeking the most productive use? Does the film focus on a common situation or a rare one?

I use clips from this. Great for valuation and goals of the corporation (maximizing shareholders wealth).

Clicheish.

This one is a very good illustration of divergence of manager and owner interests, as well as the simple need for businesses to remain competitive (and the corporate control market's enforcement of same). Again, the profanity and sexual references are problematic for classrooms, and the development of the romantic relationship between the lead characters is distracting.

Based on a true story and one that resonates with other stories.

*17. The Pursuit of Happyness*

The big takeaway is that every moment is an interview. The Will Smith character got his break because his co-worker's boyfriend noticed his work ethic.

*18. The Queen of Versailles*

No comments.

*19. Repo Men*

Cheap take-off on the original cult classic "Repo Man"

Does this have any academic financial content?

*20. Rogue Trader*

Good for discussions on the social situation and ethics.

I have used this several times. I ask students to research other rogue traders.

Good story. Educational.

*21. Rollover*

No comments.

*22. The Secret of My Success*

A good movie to illustrate career pitfalls and choices that a young professional has to make, often on short notice.

Funny but realistic today?

Saw in 1987 before my interest in finance, so again I do not remember the relevance.

*23. There Will Be Blood*

This movie was identified by my students from the oil industry as a huge reference for them, something they have watched over and over.

*24. Too Big to Fail*

There are so many other good documentaries on the financial crisis.

I have used this in my introductory finance class

I'd still read the book, though.

I assigned this movie once in a general, introductory finance class at the MBA level. It was well-received.

*25. Trading Places*

I remember seeing this in class as a student. We watched the derivatives trading scene in an investments course.

I have used this in class to introduce trading terminology and show what a short squeeze can do. I can't use the entire movie, and I must be careful these days because students are much less tolerant of foul language, even in a comedic context.

Great shots of the futures pit.





Sadly, this is the only one I've even seen so far (I need to get out more!), but I was teaching investments when it came out, and every semester when we got to futures contracts the class perked up and started asking a bunch of questions pertaining to the movie.

End of the movie has a great example of short selling.

Only the last 1/3 of the film is financial. There is a good illustration of the trading pits (now almost obsolete) and the multiplying effects of margin. One inaccuracy is the large price movement in FCOJ, given that there are usually daily limits in these markets. The profanity and brief nudity are also problematic for the classroom.

Valid point taken to an extreme.

*26. Trillion Dollar Bet*

I use this one to introduce not only the LTCM incident, but to get students ready to study the Black-Scholes formula (and its limitations). This prompts a good discussion about the limits of scientific ability to mitigate risk, black swan events, nonlinearity in general.

I have used this successfully in class.

Great to motivate a discussion on hedge funds or derivatives. The interview with Myron Scholes makes him a "real person" rather than a name in a book.

Especially useful in derivatives course. Transcript available free online.

*27. Wall Street*

The classic clip is great for corporate culture and shareholder theory discussions.

I've used scenes from this one to illustrate the necessary finance mindset for many years. Although Gordon Gecko is portrayed as a criminal, much of what he says is true regardless. "Greed, for lack of a better term, is good." In seminar we also read Jensen's "The Nature of Man" to round things out.

This is my all-time favorite finance movie.

Even though this movie is 30 years old, the themes still resonate. I have found it to be an excellent vehicle for motivating discussion of the concepts of insider trading, agency theory, shareholder wealth maximization and ethics.

This is the first movie that was introduced by Edward Dyl on using movie in the finance classroom.

Oliver Stone "over emphasizes" the bad aspects of finance, but there are key learning points about inside trading and efficient markets.

Clicheish.

I have assigned several movies in my undergraduate finance foundation course, which is required for marketing, finance, management, and accounting majors. Some of the movies were not well-received; however, this movie was -- particularly when coupled with PBS series on Bernie Madoff and Wall Street.

*28. Wall Street: Money Never Sleeps*

Clicheish.

*29. The Wolf of Wall Street*

Occasionally a student asks about this movie when I talk about the Pink Sheets for trading penny stocks. I'm happy to discuss the scene from the movie where the main character first learns about this part of the market (and is excited by the large bid-ask spreads), but I always caution students that before watching it, they should be aware that it has some really raunchy scenes.

Only one example and overdone, but informative.

Must heavily edit to show in the Christian south.

Way too much profanity for use in class.

Too many disgusting and inappropriate scenes.

I couldn't get past the first 20 minutes so it might be better if I could get past the drugs and foul language.

Stereotypes.

I assigned this movie in addition to YouTube videos regarding the real wolf on Wall Street. Students assigned this movie high ratings. The movie was assigned to a finance class consisting of finance majors with one general finance course already completed as a prerequisite. This movie was assigned in addition to a PBS movie via our university library.

Entertaining but doesn't say much about finance.

*30. Working Girl*

I saw the adult version of this movie.

I don't remember any strong finance tie.

Does this have any academic financial content?

**Table 3**

**Survey Results**
**Other Films and Video Presentations Recommended to Finance Students in Finance**

"Inside the WorldCom Scam" (CNBC *American Greed*, 2012)

"Mind Over Money" (*Nova* Season 37, Episode 7, 2010)

*The True Cost* (2015)

*They Were There* (2011)

*The Black Scholes Formula: A Documentary* (2012)

*Tin Men* (1987)

*The Ascent of Money* (2009)

*The Godfather* (1972)

*The Godfather II* (1974)

*The Social Network* (2010)





*Founder* (2016)

*Atlas Shrugged: Part I* (2011)

*Atlas Shrugged: Part II* (2012)

*Atlas Shrugged: Part III* (2013)

"Inside the Meltdown" (PBS *Frontline*, 2009)

*Princess Bride* (1987)

"To Catch a Trader" (PBS *Frontline*, 2014)

"Financial Weapons of Mass Destruction" (*60 Minutes*, 2012)

"Your Bank has Failed" (*60 Minutes*, 2009)

*Mary Poppins* (1964)

"Cosmopolis: 1919-1931" (*New York*, Season 1, Episode 5, 1999)

*The Apprentice* (Excerpts from Season 1, 2004)

*Overdose: The Next Financial Crisis* (2010)

"Money, Power, and Wall Street" (*Frontline*, 2012)

"The Warning" (*Frontline*, 2009)

"House of Cards" (CNBC, 2006)

"Valuation" (Aswath Damodaran, NYU)

"The Madoff Affair" (PBS *Frontline*, 2009)

"The Retirement Gamble" (PBS *Frontline* 2013)

"Breaking the Bank" (PBS *Frontline,* 2009)

"Inside the Meltdown" (PBS *Frontline*, 2009)

"Money, Power and Wall Street" (PBS *Frontline.* 2012)

"Secret History of the Credit Card" (PBS *Frontline*, 2004)

*Becoming Warren Buffett* (2017)

"Chris McKnett: The Investment Logic for Sustainability" Chris McKnett (*Ted Talk*, 2015)

CSPAN Rep Paul Kanjorski Reviews the Bailout Situation (https://www.youtube.com/watch?v=pD8viQ_DhS4, 2009)

"William Black: How to Rob a Bank" (*Ted Talk*, 2013)

"Andrew Choi: How to Make a Profit While Making a Difference" (*Ted Talk*, 2015)

"Roger Stein: A Bold New Way to Fund Drug Research" (*Ted Talk*, 2013)

"Dilip Ratha: The Hidden Force in Global Economics: Sending Money Home" (*Ted Talk*, 2014)

"Annette Heuser: The Three Agencies with the Power to Make or Break Economies" (*Ted Talk*, 2013)

"Pavan Sukhdev: Put a Value on Nature!" (*Ted Talk*, 2011)

"Michael Metcalfe: A Provocative Way to Finance the Fight Against Climate Change" (*Ted Talk*, 2015)

*Nerds 2.01: A Brief History of the Internet* (1998)

"To Catch a Trader" (PBS *Frontline*, 2014)

"The Untouchables (PBS *Frontline*, 2013)

"Six Billion Dollar Bet" (PBS *Frontline*, 2012)

*Shark Tank* (TV Series, 2009-present)

*The Business & Management Collection: Video Lectures & Case Studies* (various)

*Billions!!* (TV Series, 2017-present)

*A Civil Action* (1998)

*Silver Bears* (1978)

*Mindwalk* (1990)

**Table 4**: Survey Results
Courses and Movies (or Excerpts) Used in Finance Classes

**(Respondents who answered "yes" to "Do you use movies (or excerpts) in your classes?"**

*Trading Places* excerpt showing commodity exchange. Investments course.

*Trading Places*

*Trillion Dollar Bet* and *The Big Short*

I have used *Other People's Money* in basic business finance, MBA corporate finance, and MS seminar in finance. I have used *It's a Wonderful Life* in my commercial banking class, and institutions and markets class. I have used *Glengarry Glen Ross* in several of my classes to give career information for students. I have used *They Were There* by IBM in my graduate corporate finance and MS seminar classes. I have used *Barbarians at the Gate* and *Wall Street* in both corporate finance and commercial banking at different times.

Investments, *The Black-Scholes Formula*, in class.

Course is "Philosophy of Business and Free Market Economics" Movies are assigned with clips shown in class. *Other People's Money*, *Ascent of Money*, *Trading Places*. I do NOT use films that add to the general misperception of business as a Den of Thieves.





Intro finance: *Inside Job*, Advanced corporate finance: *Barbarians at the Gate*, International Finance: *Rogue Trader*. I have students watch them outside of class. I provide discussion questions. Students are responsible for discussion and a short memo.

I use movies or clips of movies in Fin 3010 Introduction to Corporate Finance: In class we see and discuss full *Trillion Dollar Bet* video in class. Out of class for credit students pick from: *Barbarians at the Gate* (1993), *Too Big to* Fail (2011), *It's a Wonderful Life* (1946), *Boiler Room* (2000), *Trading Places* (1983), *The Big Short* (2015). I sometimes use a clip of *Trillion Dollar Bet* in Fin4860 International Finance.

I used to have students pick a movie and write a review through finance lens for extra credit. But I teach in Utah and I got complaints that all finance movies are R-rated ... so I do not give that extra credit anymore. I uses to show parts of the Niall Ferguson documentary of the *Ascent of Money* when I taught financial markets class.

*The Big Short*, Principles of Finance & MBA Advanced Financial Management, outside of class *Enron*: *The Smartest Guys in the Room*, MBA Advanced Financial Management, outside of class.

Capstone undergraduate class - *Wall Street* (1987) Intermediate corporate finance - *Other People's Money* MBA Finance class Students prepare by defining terms used in the movies and reading text & other articles in advance. The movies are viewed during class and stopped periodically to discuss the topic at hand.

*Rogue Trader*, during class of undergrad and graduate level "Investments" *Barbarians at the Gate*, during class of graduate level "Corporate Finance" *Other People's Money*, during class of undergrad level "Corporate Finance" *Margin Call*, during class of undergrad "Financial Institution Management"

Principles of Finance; *Other People's Money*; the movie clips are available at YouTube; allow me to circumvent copyright issue.

I use the movies I listed, but not all of them in the same semester. I often use one of the movies I listed and discuss the learning points of the movie, how representative is the movie of the real world, and why Hollywood picks such negative business themes. Many movies are "ethics gone wild" with many good points but there is too much generalization from specific events.

Clips in class used in Personal Finance, Business Finance, Investments and Financial History. Clips change every semester.

I've shown "Inside the Meltdown" in my principles of financial management course to teach on the financial crisis. I've shown *The Big Short* in my problems & cases in finance course to teach on ethics and the financial crisis

Markets and institutions: *Princess Bride, Margin Call, The Crisis of Credit.*

Not lately, but I have in the past used the *Mary Poppins*.

In class, "Money and Capital Markets."

Advanced Financial Management - *Other People's Money*.

At least not to large extent. I would think it would be too time consuming to find them and make them.

Very selectively.

I did in classes that I used to teach.

Financial Management, *Other People's Money*, Shown in class due to copyright, excerpts available to students at class website.

*The Big Short*, *Billions* (TV series,) *Trillion Dollar Bet.*

I just occasionally TALK about the movie plots, as with *The Big Short*.

I utilize the following PBS Frontline videos since copyright is not an issue at our institution. In order of our student rankings, here is the PBS list. 1. Bernie Madoff Affair 2. Retirement Gamble 3. Breaking the Bank 4. Inside the Meltdown 5. Money, Power and Wall Street 6. Secret History of the Credit Card. I also assign YouTube videos from Bloomberg and other sources. Our university has a high proportion of first generation students, female students, and Latino/a students. Examples include: 1. History of KKR (https://www.youtube.com/watch?v=OtKizreanP0) 2. Bloomberg GameChangers Series 3. Mark Cuban, How I Became a Billionaire 4. Bill Ackman and Everything You Need to Know about finance in an hour (https://www.youtube.com/watch?v=WEDIj9JBTC8). 5. Charlie Rose and Jack Ma 6. Apple CEO sits down with Charlie Rose for a 52 minute interview 7. CEO Exchange: Down on Main Street: The Bank and the Drugstore in the 21st Century (Episode 407) DVD – 2006 8. Real Wolf on Wall Street (https://www.youtube.com/watch?v=qh3OmK_9A6M) 9. Women in Finance (https://www.youtube.com/watch? v=sbQ5I5WHOmI&list=PLdHNrgBvsSFTWArp1rZV6bYJkst7RgiHo) 10. Fintech in Latin America (https://www.youtube.com/watch?v=UmRhC3omN5M)

In the past I've shown, "Mind over Money" and some of the "Beyond Wall Street" videos, "To Catch a Trader" in my investments class. I like to show the end of *Trading Places* in investments to illustrate a short sale. I've also shown the clip on Cisco and venture capital to my money and capital markets class. I show some clips of *Shark Tank* in my corporate finance course. I wrote a paper on using *Shark Tank* in the classroom. You can find an overview here:
https://www.questia.com/read/1P3-3812796301/swimming-with-the-sharks-case-studies-inventure

Undergraduate finance classes and in class.

Corporate Finance International Finance Commercial Banking Financial Markets and Institutions All excerpts from World Famous Experts are embedded in my online classes and Discussion forum questions are posed. In class I mention a lesson learned from a movie and ask someone in the class to describe the implications based on the theory.

*Inside Job* and *Too Big to Fail* viewed in class in Cases in Corporate Finance course. *Other People's* Money and *Barbarians at the Gate* viewed in class in Corporate Mergers, Leveraged Buyouts and Divestitures course.

Capstone financial planning course - "A Civil Action" - outside of class

I have done so in an honors course I taught in the past. We used one movie (*Bonfire of the Vanities*)

Corporate Finance, Investments Derivatives, Security Analysis/Portfolio Management, Behavioral Finance. Mostly, clips are viewed in class

MBA Investments Undergrad derivatives

As links for students to view as part of their readings and preparation, typically not often in class time.

*Trillion Dollar Bet* - in class; *The Big Short* - outside of class; *Other People's Money* – excerpts in class.

# *Implementation of a New Data Analytics Curriculum: A Case Study*

***Jennings B. Marshall, Steven T. Jones, Alan Blankley, Joy Buchanan, Chad Carson, Cynthia Lohrke, Matt Mazzei, and Kevin Pan, Samford University***

## Abstract

Due to increased industry demand for graduates with strong data analytics skills, during the 2016-2017 academic year our university's business school faculty approved a major overhaul of its quantitative methods curriculum. In this paper, we explore the process of identifying needs, designing a revised program, and implementing this program, with particular emphasis on the process of identifying and addressing areas for improvement during the program's first year.

## Introduction and Literature Review

Several papers have addressed the development of analytics majors. Zhao and Zhao (2016) found that less than 20% of the 215 schools had Bachelor's degree programs in business analytics. Aasheim, Williams, Rutner, and Gardiner (2015) found that undergraduate data analytics programs had more emphasis on the evaluation of tools while undergraduate data science programs had more emphasis on data preparation. Phelps and Szabat (2017) found that business analytics courses are taught by faculty trained in a diverse set of disciplines, such as statistics and information systems.

To help establish a business analytics program, Wymbs (2016) described the process of adding an undergraduate Data Analytics program to an Information Systems Department, and suggested that an innovative process model was useful. Wang and Gu (2016) discussed the challenges of teaching data science in a business school due to students' insufficient backgrounds, and suggested teaching R (an open-source analytics software) to students due to its popularity. Wilder and Ozgur (2015) proposed a curriculum for business analytics undergraduate majors; this curriculum includes data management, descriptive analytics, predictive analytics, prescriptive analytics, data visualization, and data mining.

There are several papers that discussed the incorporation of data analytics in specific undergraduate courses. Frydenberg (2015) described the inclusion of big data concepts in an introductory information technology course for first-year students. Ashraf (2017) presented a Python program for scraping information off SEC's EDGAR website, and suggested that this Python program be used in a graduate data analytics course. Wu, Mai, and Yu (2015) presented a course teaching data mining using R. Dichev et al. (2016) presented a course which includes Python programming.

Furthermore, it is not sufficient to simply teach data analytics for the sake of teaching analytics. Business schools need to prioritize what to teach to help their graduate add value to their employers and the society. Cárdenas-Navia and Fitzgerald (2015) suggested that there is a need to teach data analytics in the context of the field in which it is applied. Likewise, Henry and Venkatraman (2015) suggested that there is still a need to introduce data analytics in the undergraduate business curriculum, while also stating that it is an open question how to do so.

## Background: Prior Curriculum

Up through and including the 2016-2017 academic year, the quantitative methods curriculum in the Brock School of Business at Samford University (hereafter "BSOB") consisted primarily of two statistics courses, designated as Quantitative Methods II and Quantitative Methods III. (The course names were an artifact of a previous requirement, since dropped, that a course in business calculus, known as Quantitative Methods I, be taken prior to the first business statistics course.) Additionally, information systems and technology topics were covered with a one-credit class, with an emphasis on the study of computer software applications currently being employed in business analysis (e.g., PowerPoint, Excel, and Access). The curriculum for the junior year included a three-credit course that emphasized the study of the relevance and contribution of information systems to the growth and success of businesses. This course included a focus on technical concepts relating to fundamental hardware, software, and communications concepts associated with the management of computer technologies.





Due to the aforementioned employer demand for enhanced student training in the area of data analytics, the BSOB faculty voted at the end of the 2015-2016 academic year to undertake a wholesale revision of its quantitative methods curriculum and the information systems and technology curriculum during 2016-2017, with a goal of implementing the revisions beginning in 2017-2018.

## Ad Hoc Data Analytics Committee

The ad hoc Data Analytics Committee consisted of Alan Blankley (chair), Cynthia Lohrke, Matt Mazzei, Chad Carson, Kevin Pan and Jennings Marshall. The committee was committed to a data-driven revision of the curriculum. Members of the committee first read and reviewed articles on data analytics; after that, the committee conducted both an internal faculty survey, and an external survey of business executives (the 88 members of the school's four advisory boards), to determine the needs and expectations of both groups regarding topic coverage. The committee received responses from 50 board members – an 88% response rate – representing a broad array of functional areas.

For purposes of brevity, all tables are omitted from this proceedings version of the paper. However, our results may be described as follows. First, the survey respondents agreed by significant margins that undergraduate students need basic, foundational knowledge of spreadsheets. 86% of survey respondents indicated that undergraduate students need to be able to perform calculations, use built-in functions, and build their own formulas, while 82% agreed that undergraduates need to be able to properly design a spreadsheet to manipulate and analyze data efficiently, including knowledge of spreadsheet functions such as lookups. However, a substantial majority of respondents (68%) did not see a need for undergraduates to know more advanced features such as how to program macros in Visual Basic. Respondents' rating of advanced Excel features was significantly lower than basic or intermediate Excel skills ($p<0.0017$.)

Of the three questions posed regarding the broad area of Data Management, data retrieval skills were rated by the most respondents (60%) as a skill that should be required, closely followed by the ability to merge or compile data from multiple sources (54%). Fewer respondents thought database management system (DBMS) skills should be required (38%), although the results of Fisher's Exact test indicate that the differences in answers between these three questions were not statistically significant. This suggests that board members think it is more important for business professionals to know how to retrieve and use data than it is for them to know how to manage data.

Two-thirds of respondents (68%) indicated that they thought the skill of descriptive statistics should be required for undergraduates. Interestingly, however, a large majority of respondents also thought that both predictive statistics (76%) and prescriptive statistics (68%) should not be required for undergraduate business majors. These results suggest that for non-analytics undergraduate business majors, it is important for them to summarize and describe data, but not as important for them to make predictions based on data.

In addition to competency in calculating statistics, we also wanted to understand the importance of the ability to find and gather data to support a business activity. Somewhat surprisingly to us, respondents overwhelmingly supported the notion that this skill should be required of business undergraduates, significantly more so than with predictive and prescriptive statistics. This finding once again highlights the significant distinction between teaching data analytics specialists and teaching data-driven business professionals. It is important for data analytics specialists to acquire skills in predictive and prescriptive analytics. For data-driven business professionals, on the other hand, it is more important to ask relevant business questions and find data for the questions. Once they have gathered the relevant data, they can hand off the technical tasks of statistical modeling to specialists. However, the competency of asking proper questions, identifying applications for data-driven decision making, and executing projects to gather relevant data is a core competency that business professionals need to have.

Our fourth research question focused on student skills related to software tools (other than spreadsheets) used in Analytics for statistical analysis or data visualization. This is an area that has received increasing attention in news media such as the *Wall Street Journal*, and is often regarded as necessary for analytics majors (Wang and Gu, 2016).

To understand the importance of this competency among data-driven business professionals rather than data analytics specialists, we asked our respondents four questions: Is it important for students to be able to have some ability to use dedicated statistical software to generate statistics on an as-needed basis? Is it important for students to have proficiency with dedicated statistical software on a regular basis? Is it important to students to develop programming competency using dedicated statistical software? Finally, is it important that students become proficient with data visualization software?

Results were instructive. Professionals widely and overwhelmingly regarded any proficiency with dedicated statistical software as not being necessary for undergraduate business majors. 92% of respondents thought that even basic use was more appropriate for Analytics minors or graduate students. 96% thought the same of intermediate proficiency. 90% responded in the same way for programming ability. In fact, these three questions generated the most responses indicating that the topic was beyond what was expected at the undergraduate level, with 22% thinking that of basic use, 34% thinking that of intermediate

use, and 48% thinking that of programming. This surprising finding once again confirms the significant difference between teaching data analytics majors and teaching business majors that need to be data competent.

Another question asked respondents how important they considered a student's ability to present findings visually using spreadsheets and presentation software. Respondents indicated that being able to present visual representations of results and being able to communicate those results verbally are critically important. 92% and 94%, respectively, rated these skills as required for all undergraduates.

We compared the aggregate responses to the survey questions related to each research question against the aggregate responses pertaining to all other research questions. This allowed us to gauge which group of competencies respondents emphasized the most. Surprisingly, Communication Using Data was the area that had the highest rating among survey respondents. The broad area with the next highest ratings was Spreadsheet, Data Management, and Statistics. The difference between the average ratings of these two groups of competencies was not statistically significant. Unexpectedly, the area receiving the lowest rating was Software Packages, which was rated significantly lower than all the other broad areas. This appears to represent a continuing perceived need by employers for students completing their degrees to be well versed in timeless intellectual attributes, and strongly indicates that any curricular revision to integrate analytics must include a strong emphasis on communication of technical data.

Our teaching experience tends to validate this recommendation. When we teach software packages, students often understandably get preoccupied with learning the mechanics of how to use the software. They stop at the point of getting numbers in and getting numbers out. Unless they are forced to apply critical thinking, what they learn from the exercise is simply how to format the data to feed software packages. The value of this skill is not particularly great over the long term, as software packages change over time. If students only learned how to use specific software packages, rather than learning generalizable principles, their skills would likely become outdated very quickly.

Subsequent to the survey, we also had the opportunity to meet personally with some of the business school's Advisory Board members. There was near unanimous agreement that they regarded communication using data as critically important. They made the point that they have no trouble finding people with the requisite technical skills to perform an analysis, but they have tremendous difficulty finding people who can both conduct the analysis and communicate relevant results accurately, clearly, and comprehensibly to organizational decision-makers.

## Curriculum Revisions

As noted above, in addition to a survey of the school's four advisory boards the committee carried out an internal faculty survey. This faculty survey was very helpful, because it allowed us to identify areas and topics in the quantitative analysis part of the curriculum that could be deemphasized, thus freeing up time and space for the new data analytics topics. The survey also identified several areas that could be removed and/or drastically deemphasized in the area of information technology. With this knowledge, and the information gained from our external survey, the faculty members teaching these courses made adjustments accordingly.

Additionally, topics that remained within the quantitative methods curriculum would have a new emphasis: statistical computations that had been done in the past as part of statistics would now be done almost exclusively with large data sets and an emphasis on the problems and opportunities created when working with large data sets.

The before-and-after design of our program can be summarized as follows. The previous Computer Software Competency course (BUSA 260), which had focused on both Excel and PowerPoint, was replaced with a course known as Introduction to Spreadsheet Applications (DATA 200). This new course focuses primarily on Excel, with a limited introduction to Microsoft Access.

Quantitative Methods II (BUSA 231) was a very traditional business statistics course. This course was replaced with Introduction to Data Analytics (DATA 201). With the introduction of data analytics, the core topics remain; however, several significant changes have occurred. The use of very large data sets has become the norm. A great deal more course time and homework has been devoted to the fundamental issues associated with large data sets, such as the problems of missing data and outliers that are almost invariably present in large data sets. All survey data indicated the need for enhanced skills with Excel; therefore; the use of Minitab was eliminated in favor of using Excel for all statistics, graphs, tables, and charts.

Quantitative Methods III (BUSA 332), which had been required for students pursuing any BSOB major other than accounting, was replaced with Intermediate Data Analytics (DATA 301), which is required for all BSOB majors, including accounting. The Quantitative Methods III course had been a traditional second semester follow-up to the Quantitative Methods II class. It began with hypothesis testing for two-means, and proceeded through analysis of variance, nonparametric statistics, regression, and time series. The new Intermediate Data Analytics course builds on both the new course in Introduction to Spreadsheet Applications and the new course in Introduction to Data Analytics. It focuses on data management using diverse





software applications, data analysis using Excel to test hypotheses in order to answer business questions, and communicating insights gained through the analysis.

Finally – and involving arguably the most comprehensive change in terms of course content – the previous course in Information Systems and Technology (BUSA 360) was replaced with Advanced Data Analytics (DATA 401). In this class, students continue their exposure to data analytics by studying advanced statistical techniques and methods, managing and manipulating large data sets in order to produce actionable information, and communicating this information to interested parties.

This is designed as a capstone course, in which it is intended that students integrate and apply what they have learned in the prior three courses of the sequence. The first half of the course is devoted primarily to decision algorithms and using software for programming. The focus of the second half of the course is the preparation of a presenting a data study, which may draw on skills learned in earlier data courses and other business classes.

## Challenges and Responses

As with any major curriculum overhaul, we were fully expecting to encounter some challenges with implementation. Further, we realized that the set of challenges was likely to include some surprises – issues that we had not anticipated or even considered. Below, we detail some of the challenges, both short-term and long-term, that became evident during the Fall 2017 semester. We also discuss our preliminary response to those challenges.

### *Challenges Created by Change in Curriculum*

One challenge that would have been more surprising by its absence than by its presence was a degree of trepidation among our current students regarding how their course of study was going to change. Like most schools, the BSOB distributes "templates" to its students regarding the typical course of study for an Accounting major, an Economics major, etc. So, for instance, a freshman business major would have learned during the Spring 2017 semester that instead of "Quantitative Methods II," he or she would be taking a course called "Introduction to Data Analytics" as a sophomore. Thus, one inevitable challenge created by the new curriculum was simply the "this is not what I was expecting" factor among students.

A second issue, which we did not fully anticipate, involved the ability of instructors teaching upper-level courses to anticipate the level of preparation that their students would have received from lower-level courses. For all practical purposes, this simply had not been a factor under the prior curriculum. While course delivery might well evolve, the basic course content had been quite consistent over time. So, for instance, the professors who taught Quantitative Methods III had a clear, detailed understanding of what their students would have been taught in Quantitative Methods II.

During the Fall 2017 semester, however, it quickly became evident that this previously non-existent issue was going to create some challenges. These challenges arose because of two related but somewhat separate issues.

First, even after the new curriculum had been fully implemented, the overall curriculum obviously was going to differ in substantive ways from the previous curriculum. So, for instance, effective delivery of Intermediate Data Analytics was going to require that the instructor be fully aware of the changes that had been implemented in Introduction to Data Analytics, relative to the Quantitative Methods II course that it replaced. Moreover, effective delivery of the completely new Advanced Data Analytics course was going to require that the instructor be fully informed regarding topic coverage in all of the revised courses.

In addition, however, the transition itself created a more pressing issue. Since the revised program was implemented across the board during the 2017-2018 academic year, students taking an upper-level course would, by definition, be taking the "new" version of that course, after having taken the "old" version of the prerequisite course(s). This created a dilemma for faculty members teaching the upper-level courses: should they leave out some of the material that the courses were designed to deliver, or should they forge ahead? In addition, if the choice was the latter, how much time that would have otherwise been devoted to the "new" material should the instructors spend reviewing the topics that would have been covered in the prerequisite courses, if the students had had the "new" versions of those courses?

### *Responses to Challenges*

While problems – even problems that were not specifically anticipated – are to be expected whenever a curriculum is changed significantly, those problems call for a response and, where necessary, adjustments. As the Fall 2017 semester progressed, we developed differing responses to these growing pains.

While the issue of student angst regarding the fact that the curriculum had changed did call for a response, it seemed clear to us that this issue should not and could not be allowed to derail the curriculum changes themselves, which after all had been made specifically because they were deemed essential to the students' preparation for life after graduation. Said another way,

it would not have made sense for the BSOB, and/or the specific instructors delivering the data analytics curriculum, to respond to this (largely anticipated) reaction by changing any of the key decisions that had been made. Rather, the response to student anxiety simply had to be one of communication.

On the other hand, the issue of optimizing the match of course delivery to student readiness clearly merited a substantive response and, where appropriate, substantive changes. Student learning requires both the introduction of new material, and the presence of sufficient background knowledge to facilitate absorption of that new material.

So, the faculty delivering the data analytics curriculum met roughly midway through the Fall 2017 semester to discuss what instructors in upper-level courses could expect their students to know coming into those courses. This conversation was specifically designed to address this issue from the separate vantage points of both the current academic year, and future years after the new curriculum has been in place and students have had the "new" versions of the lower-level courses. Both of those issues, while vital, were easily addressed through a combination of verbal clarification and providing course syllabi.

Ironically, then, the more "substantive" issue – that of ensuring that faculty in upper-level courses were attuned to what their students could be assumed to have been exposed to coming into those courses – proved to be the more straightforward problem to fix. The more "perceptual" issue – in essence, the "who moved my cheese?" reaction among students – may very well be less fixable, at least in the short run.

## Conclusions and Implications for Future Programs

We see three lessons to date from our experience. First, whenever changes of this nature are contemplated, the composition and leadership of the committee charged with developing the new curriculum is critical. In our case, this was a success. Each of the instructors for the data analytics courses are a part of our Department of Economics, Finance, and Quantitative Analysis. Further, because of the way that our curriculum had previously been designed, it was the accounting major that was impacted most heavily by the changes. For both of those reasons, having the committee chaired by the head of our Accounting department made it considerably easier to "sell" the program to our internal constituents.

Second, clear and early sharing of information among the faculty teaching the courses within a new curriculum is vital. In retrospect, it seems blindingly obvious that we should have had thorough discussions prior to the start of the Fall 2017 semester regarding what faculty in upper-level courses should be able to expect their students to know coming in. It seems plausible that the thorough familiarity of the previous curriculum had become second nature, to such an extent that we simply overlooked the fact that this would not be the case with the new curriculum.

Third, while this came as no surprise to us, we have been reminded by this transition that a curriculum change of this magnitude – even when thoroughly vetted and unanimously approved by the faculty – will inevitably and even understandably engender a degree of disquiet among students. Although this student unease cannot be eliminated, it can and should be mitigated by clear communication of the goals of the new curriculum, particularly on the part of those faculty who are delivering the curriculum.

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# *Bootstrapping a Zero-Coupon Yield Curve: An Exercise for Finance Students*

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## Abstract

Since Treasury bills, notes and bonds of different maturities have different coupon rates, a traditional yield curve cannot be used to accurately price other bonds. A zero-coupon yield curve must be constructed from information found in current Treasury debt instruments through a process known as "Bootstrapping". We have developed an Excel spreadsheet with an imbedded macro that will obtain current Treasury quotes from the Wall Street Journal's website, download them to the spreadsheet, and use them to bootstrap a zero-coupon yield curve. Using this spreadsheet in the classroom allows students to better understand how bonds are priced through experiential learning.

## Introduction

Introductory finance courses at both the undergraduate and graduate level typically teach students that the value of any financial asset is the present value of its (expected) future cash flows. This involves two steps. First, the cash flows must be forecast. Second, an appropriate discount rate (or appropriate discount rates) should be selected. It is crucial that the discount rate(s) reflect the riskiness of the cash flows.

When pricing Treasury notes or bonds, the cash flows are easy to determine. The semiannual coupon payments are set from the bond's coupon rate and the face value is paid at maturity. For simplicity, we often speak of a bond's price, face value, and coupon payments as percentages of the face value. So a bond with a face value of $10,000, a coupon rate of 6.50%, and a price of $10,100 will have a face value of 100, semiannual coupon payments of 3.25, and a price of 101.

The interest rate that equates the observed price of the bond with the present value of its future cash flows is the bond's yield. With semiannual coupon payments, a semiannual yield is easily calculated. By convention, the yield-to-maturity of the bond is its semiannual yield multiplied by 2.0 (this ignores compounding within each year, but everyone who deals in bonds realizes this). An investor will earn this yield if he holds the bond until maturity, if all the cash flows are paid in full and on time, and if the investor reinvests each coupon payment at that yield until the bond matures.

To price a bond, introductory finance courses teach students to discount the bond's face value and coupon payments at its semiannual yield. Thus, the bond's yield must be known in order to find its price. When students ask where we find this yield, we typically tell them that similar bonds will have similar yields, so you look at the yield for another bond that has the same credit quality (for Treasuries, that would mean another Treasury), and the same number of years till maturity. What this neglects however, is that the bond we are seeking to price probably has a different coupon rate from the (similar) bond that we are using to obtain a yield. While this subtlety may not be necessary to explore in an introductory finance course, it is important enough to include in any advanced course dealing with fixed-income analysis (FIA) and in-fact is critically important to bond traders who want exact prices of bonds with face values of $1 million or more.

In advanced courses that teach FIA, it is taught that a Treasury bond or note should be viewed as a series of independent cash flows and that each cash flow should be discounted to its present value at the discount rate that investors require for a single zero-coupon cash flow guaranteed by the U.S. Treasury. Currently, the treasury issues 6-month and 1-year Treasury bills – each of which offer a single cash flow at maturity. These bills are auctioned weekly. Thus, it is simple to look at the semiannual yield that can be earned on the most recently issued 6-month and 1-year bills to find the discount rates that investors require for any treasury-guaranteed cash flows occurring 6-months and 1-year from now.

The challenge starts when we try to find a single treasury-guaranteed cash flow that will be paid 18 months (1.5 years) from now. The yield on a Treasury note or bond that matures in 18 months reflects three cash flows – a coupon payment that comes in six months, another coupon payment that comes in one year, and a third coupon payment (plus the face value) that is paid in 18 months. Roughly speaking, the yield is an average of the discount rates that investors require on these three separate cash flows – not the discount rate for a single cash flow to be received in 18 months. However, if we have already found the semiannual yield that investors require for cash flows that the treasury promises in six months and one year from its Treasury bills, and we observe the price investors are willing to pay for a coupon-paying Treasury note or bond that matures in 18 months, we have an equation with only one unknown – the discount rate that investors must require for a treasury-guaranteed cash flow that is promised to be paid in 18 months. Finding that rate in this manner is known as bootstrapping.





## The Bootstrapping Process

The second edition of the fixed income text that is used in the CFA Institute Investment Series says, "The theoretical spot rates for Treasury securities represent the appropriate set of interest rates that should be used to value default-free cash flows. A default-free theoretical spot rate curve can be constructed from the observed Treasury yield curve" (Fabozzi, 2007, p. 135). What is referenced by Fabozzi as a spot rate curve, can also be called a zero-coupon yield curve (Petitt, Pinto, and Pirie, 2015). Teaching students how to construct such a curve and how it can be used to price both risk-free and risky bonds is the object of this exercise.

Once we have used the bootstrapping technique to find the rate that investors require for a single cash flow to be received in 18 months, we can find the rate they require for a single cash flow to be received in two years by observing the price and coupon payments for a Treasury bond or note that matures in two years. We use the 6-month, 1-year and 18-month discount rates that we have already found, and solve for the 2-year discount rate that equates the present value of these four separate cash flows with the observed price of the bond. This process can be carried on for up to 30 years since the U.S. treasury issues 30-year bonds. In our exercise, we carry out this bootstrapping process for ten years.

As an example, suppose we observe the following Treasuries, which are actively traded:

| Maturity (years) | Coupon Rate (%) | YTM(%) | Price ($) |
|---|---|---|---|
| 0.5 | NA | 8.0 | 96.15 |
| 1.0 | NA | 8.3 | 92.19 |
| 1.5 | 8.5 | 8.9 | 99.45 |
| 2.0 | 9.0 | 9.2 | 99.64 |
| 2.5 | 11.0 | 9.4 | 103.49 |
| 3.0 | 9.5 | 9.7 | 99.49 |
| 3.5 | 10.0 | 10.0 | 100.00 |
| 4.0 | 10.0 | 10.4 | 98.72 |
| 4.5 | 11.5 | 10.6 | 103.16 |
| 5.0 | 8.75 | 10.8 | 92.24 |
| 5.5 | 10.5 | 10.9 | 98.38 |
| 6.0 | 11.0 | 11.2 | 99.14 |
| 6.5 | 8.5 | 11.4 | 86.94 |
| 7.0 | 8.25 | 11.6 | 84.24 |
| 7.5 | 11.0 | 11.8 | 96.09 |
| 8.0 | 6.5 | 11.9 | 72.62 |
| 8.5 | 8.75 | 12.0 | 82.97 |
| 9.0 | 13.0 | 12.0 | 104.30 |
| 9.5 | 11.5 | 12.4 | 95.06 |
| 10.0 | 12.5 | 12.5 | 100.00 |

As mentioned earlier, the 0.5 and 1.0-year treasuries are Treasury bills and are sold at a discount with no coupon payments. Thus the six-month zero-coupon rate is 8.0%/2 = 4.0% and the one-year zero-coupon rate is 8.3%/2 = 4.15%. In this exercise, we call each of these spot zero-coupon rates "Zs" where $Z_1$ is the six-month zero-coupon rate, $Z_2$ is the one-year zero coupon rate, $Z_3$ is the 1.5-year (18-month) zero-coupon rate, etc. While $Z_1$ and $Z_2$ are easily calculated, $Z_3 - Z_{20}$ need to be bootstrapped from the data. To find $Z_3$, we look at the 1.5-year treasury with an 8.5% coupon rate and a price of 99.45. This price of 99.45 is the present value of the bond's three future cash flows with each cash flow being discounted at its market-determined zero-coupon rate:

$99.45 = 4.25/(1+Z_1) + 4.25/(1+Z_2)^2 + 104.25/(1+Z_3)^3$.
$99.45 = 4.25/(1.04) + 4.25/(1.0415)^2 + 104.25/(1+Z_3)^3$.
Therefore, $Z_3 = 4.465\%$ semiannually with a bond-equivalent-yield of 8.93%.
Extending this out to find $Z_4$:
$99.64 = 4.50/(1+Z_1) + 4.50/(1+Z_2)^2 + 4.50/(1+Z_3)^3 + 104.50//(1+Z_4)^4$.

$99.64 = 4.50/(1.04) + 4.50/(1.0415)^2 + 4.50/(1.04465)^3 + 104.50//(1+Z_4)^4$.
Therefore, $Z_4 = 4.624\%$ semiannually with a bond-equivalent-yield of 9.247%.
If this is continued for all ten years of data, we find that $Z_{20} = 6.812\%$

While extending this process out all the way to $Z_{20}$ can certainly be done, I'm sure the reader can see that it will take students quite a bit of time. Additionally, all the values I used in this example are made-up. Obviously, these yields are much higher than we observe today. However, once we have all the Zs, we can price any Treasury with a maturity up to 10 years by discounting its cash flows as separate zero-coupon cash flows, discounted at the market-determined Zs that we have bootstrapped. Once we have a price for our bond, its yield-to-maturity can be found in the usual way by finding a single discount rate that equates that price with the present value of the coupon payments and face value. In our example, a 10-year bond with a 10% coupon rate will be discounted at the Zs to a price of 85.35477. Its yield will be 12.618%.

Corporate bonds are typically priced off of a treasury that has the same maturity and coupon rate. Since corporate bonds are subject to the risk of default, their Zs are set at some value above the Zs of the treasury they are being priced off of in order to reflect this credit risk. So if a company is looking to issue a corporate bond with a 10% coupon rate (like the example above) and it is determined that investors will require an additional yield of 1.00% as compensation for its credit risk, that 1.00% needs to be added to $Z_1 - Z_{20}$ to come up with the appropriate discount rates for the corporate bond's cash flows. Of course, this will result in the corporate bond having a lower price than the otherwise similar treasury.

## The Spreadsheet

Our spreadsheet allows students to price a 10-year corporate bond with whatever coupon rate and credit spread (over a comparable treasury) that the student (or instructor) choses. It uses the bootstrapping procedure explained earlier with current treasury data. It does this through the use of a macro which is embedded in the spreadsheet which goes to the Wall Street Journal's website and reads the Journal's Treasury bill, note and bond quotes at http://online.wsj.com/mdc/public/page/2_3020-treasury.html?mod=topnav_2_3010.

To access our spreadsheet, go to https://tulane.box.com/s/so124zgbuwkrkaigpai9esxiytnn4zvi and download the folder "Bootstraping.zip". Open the folder, extract the files, and run the executable file titled "WSJ". When you then open the excel file titled "Bootstrapping 6-22-16" and click on the "to get started, click here" button, the spreadsheet will fill with the data you want. Complete directions can be found in Appendix 1 – Instructions for Students.

Once the executable file has been run our spreadsheet can access the WSJ Treasury Quote data. The spreadsheet determines today's date through the "Today" function and from it, calculates dates which are six months, one year, 18 months, two years, etc. from today – all the way up to 10 years from today. When a student clicks on the blue "to get started, click here" button, the macro downloads the current Treasury data from the WSJ website and looks for the Treasuries that mature closest to those dates. If two different Treasury issues mature on the same date (or the same number of days from the six-month date), our algorithm selects the Treasury that is priced closest to par value. The 6-month and one-year selections will always be zero-coupon Treasury bills and the remaining 18 selections will be coupon-paying Treasury notes or bonds. For the Treasury bills, our spreadsheet reads the yield-to-maturity and calculates $Z_1$ and $Z_2$ from them. For the Treasury notes and bills, our spreadsheet reads their coupon rate and price – the data that is needed to bootstrap $Z_3 - Z_{20}$.

Once all 20 Zs have been calculated, our spreadsheet can price any Treasury bill or note with a maturity of up to 10 years. By default, the spreadsheet prices a 10-year Treasury note, but students can easily modify it to price a treasury with a shorter maturity. Since students have been taught that the price (value) of a Treasury is the sum of the present values of its cash flows – with each cash flow being discounted at its market-determined zero-coupon rate – students only need to select a coupon rate to have the spreadsheet calculate the price of their desired Treasury. In addition to calculating this bond's price, our spreadsheet also calculates its yield-to-maturity.

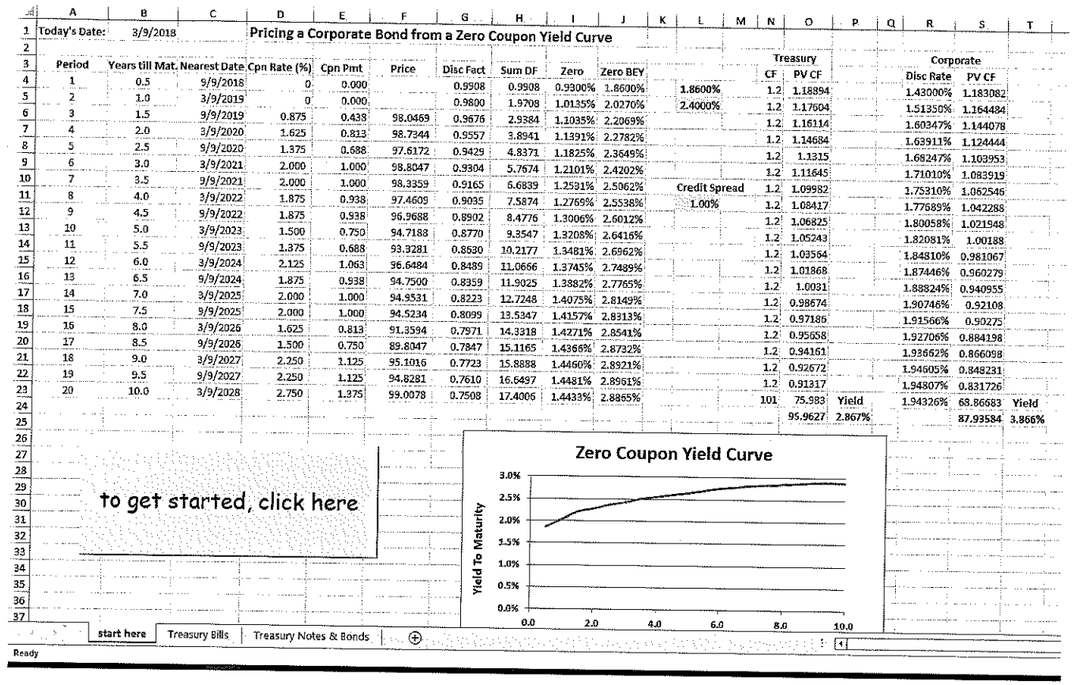
To price a comparable corporate bond, students need to select a credit spread. The spreadsheet adds this credit spread to each of the Zs ($Z_1 - Z_{20}$) and discounts the cash flows of a bond with the selected coupon rate at these higher discount rates. The sum of those discounted cash flows gives the student the bond's price and its yield is calculated from there.

One additional feature of the spreadsheet is that it graphs a Zero-Coupon Yield Curve from the Zs that it calculates. This allows instructors to discuss the term structure of interest rates with students while referring to a completely up-to-date yield curve.





When complete, here is what the spreadsheet looks like:




We have found that this spreadsheet is best used after students have been taught how to bootstrap and have had a chance to bootstrap (by hand) one or two treasuries with fairly short maturities (perhaps two years). As with many time-saving math tools, the bootstrapping process is best understood before students are told that there is a spreadsheet that will do most of the work for them.

We have also found it helpful to show students the algebra behind the spreadsheet calculations of the Zs prior to giving them access to the spreadsheet, but after working through a couple of bootstrapping examples by hand. Here is how we explain it to them:

*The term "discount factor" means* $\frac{1}{1+z_1}$ *or* $\frac{1}{(1+z_2)^2}$ *or* $\frac{1}{(1+z_3)^3}$ *etc.*

*So "sum of the discount factors"* $= \frac{1}{1+z_1} + \frac{1}{(1+z_2)^2} + \frac{1}{(1+z_3)^3}$ *etc.*

*If we have a bond maturing in 1.5 years (3 semiannual periods from now):*

$$P = \frac{C}{1+z_1} + \frac{C}{(1+z_2)^2} + \frac{C+100}{(1+z_3)^3}$$

***Which can be rearranged as:***

$$(1+z_3)^3 = \left( \frac{C+100}{P-\left( \frac{C}{1+z_1} + \frac{C}{(1+z_2)^2} \right)} \right)$$

and

$$z_3 = \left( \frac{C+100}{P-\left( \frac{C}{1+z_1} + \frac{C}{(1+z_2)^2} \right)} \right)^{1/3} - 1$$

If we pull out the Cs in the denominator, we get:

$$z_3 = \left( \frac{C+100}{P-C\left( \frac{1}{1+z_1} + \frac{1}{(1+z_2)^2} \right)} \right)^{1/3} - 1$$

Notice the sum of the discount factors in the denominator.

At this point, instructors who want to give students a more complex excel-task can assign them to design a spreadsheet using this format that will bootstrap a bond with as many semiannual periods as desired – by using only one row for each semiannual period. Of course, this is exactly what our spreadsheet does, so this task should only be assigned if the students have not yet seen the spreadsheet.

Once students understand the terms "discount factor" and "sum of the discount factors" as used above, they can more easily see how our spreadsheet calculates the Zs in column I by first calculating each discount factor in column G and the sum of the discount factors in column H.

Appendix 1 contains the instructions we give students – explaining where to go to find the spreadsheet and exactly what steps need to be taken to access it and get the macro to download the current WSJ Treasury quotes. It is important to note that this spreadsheet was designed to be used with PCs. The computer using this spreadsheet must be set up to allow macros and be connected to the internet.

Appendix 2 is the questions that we typically assign students to answer for this exercise. While questions 1-3 merely require the students to place the correct values in the cells with the blue highlights, question 4 requires students to go a bit further. Since any bond which is selling at par value (100) has a coupon rate equal to its yield-to-maturity (and thus its semiannual coupon rate equals its semiannual yield), solving for the YTM is essentially solving for the coupon rate. Since we know the Zs and the price of the bond (100), the coupon payments are the only unknown in our equation. Doing this for a series of different maturities will allow students to construct a par bond yield curve. Sundaresan (2002) describes how a par bond yield curve is frequently used in industry.

We use questions 5 and 6 in appendix 2 to see if students can apply their understanding of different theories of the term structure to today's yield curve. Of course, these questions should only be included if these concepts have already been covered in class or in assigned readings.

## Conclusion

Advanced courses in Fixed Income Analytics teach students that bonds should be priced as a series of zero-coupon cash flows, with each cash flow being discounted at its own separate zero-coupon rate. Bootstrapping is the process through which we find those zero-coupon rates. While it is important to show students how the Bootstrapping process works, they can understand it much more completely through experiential learning where they get an opportunity to bootstrap a zero-coupon yield curve using real-time data without spending several hours doing it by hand.





Our spreadsheet allows students access current Treasury bill, note and bond quotes from the Wall Street Journal website and use that data to bootstrap current and accurate zero-coupon rates, which are used to price a 10-year Treasury note with whatever coupon rate the student choses. Students can also price a 10-year corporate bond with a defined credit spread to the comparable treasury. Finally, the current zero-coupon yield curve is graphed, allowing for further discussion on the term structure of interest rates. We have found that using this spreadsheet in class and in assignments has contributed to our students' understanding of the Bootstrapping process in the study of fixed income analytics.

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## Appendix 1 – Instructions for Students

1. Go to https://tulane.box.com/s/so124zgbuwkrkaigpai9esxiytnn4zvi
2. Download the folder "Bootstrapping.zip"
3. Open the folder. A window will open with 15 files in it
4. Extract all files. A new window will open with the same 15 files in it.
5. Double click on the last file "WSJ". Select "Run" if asked. A black window might appear and then disappear – that is normal.
6. Double click the "Bootstrapping 6-22-16" Excel file to open it.
7. Enable Editing and Enable Content if requested.
8. Verify that today's date appears in cell B1
9. Click on the large blue button that says, "to get started, click here".
10. A macro in the spreadsheet goes to the Wall Street Journal's website and extracts the current data for Treasury Bill, Treasury Note and Treasury Bond quotes. This data will show up in the worksheets titled "Treasury Bills", and "Treasury Notes & Bonds".
11. The worksheet titled "start here" will read data in the other two worksheets and insert the proper data in cells J4-J5, D6-D23, and F6-F23.
12. Type "2.4%" into cell L5
13. With this current data inserted into the spreadsheet, $Z_1 - Z_{20}$ will be calculated, a zero-coupon yield curve will be bootstrapped and graphed, and the price of a theoretical 2.4% 10-year Treasury Note will appear in cell O24. Its Yield-to-Maturity will be in cell P24.
14. If you want to find the price and yield of a theoretical 10-year Treasury Note with a different coupon rate, just change the value in cell L5 (blue highlight).
15. To price a Corporate bond, select a credit spread and insert it into cell L11 (blue highlight). A credit spread of 1.00% will be there by default. The price of this corporate bond will appear in cell S24. Its yield will be in cell T24.
16. Take a close look at the Excel formulas that were used to obtain all these values. You should be able to follow and understand each of them.

## Appendix 2 – Suggested Questions for Students

1. What is the price of a bootstrapped 2.4% (coupon rate) 10-year Treasury note?
2. What is the YTM of the Treasury note in question 1?
3. Price a 10-year 2.4% corporate bond so that it has a 50- basis point credit spread over the Treasury note you bootstrapped.
4. Using the zero-coupon rates (the semiannual z values) that that were found in the bootstrapping spreadsheet, find what the YTM would be for a previously-issued Treasury bond that matures in exactly two years and is currently selling at par value.
5. Look at the Zero Coupon Yield Curve that the bootstrapping spreadsheet made. How would you describe the shape of this yield curve?
6. Based on the Unbiased Expectations Theory of the term structure, what does this yield curve tell us about investors' expectations over the next ten years?

# *Outsmarting Utilities By Converting Housing Into Cashflows*

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## Abstract

Using two case studies within Central Florida we consider the mechanisms available to typical householders to convert their homes into ATMs using environmentally beneficial Solar PV installations, alongside other potential home improvement technologies. Federal support for solar photovoltaic installation programs extends through 2019, allowing positive NPV solar installations to turn homes into cashflow generators, while contributing environmentally to reductions in global warming. Other opportunities include insulation improvements, water recapture systems and solar thermal to minimize ongoing rising utility costs. We discuss a financial decision-making framework for householders, based on existing installation data, and the ramifications for non-participants and utility companies.

## Introduction

The home is typically the largest asset available to the owner, however in most cases it is often considered to be a cost centre or liability, rather than an asset or income generator. In economic terms a house is traditionally viewed as an investment in the provision of shelter, rather than as a potential revenue stream available to the householder, unless the home is intentionally leased out. Recent opportunities to develop technologically-driven passive revenue streams from homeownership have become widely available, making this research area especially worthy of investigation since housing represents the single biggest asset available to most owners.

Costs associated with a home's operation, in addition to its annual overhead or operating budget, include energy, water, sewage, other related expenditures such as property taxes, as well as any maintenance incurred on preserving the state of the home. Costs within the household can be broken down into three distinct categories; the first category would be taxes such as real estate taxes and other taxes associated with the cost of direct home ownership. The second are the operating costs themselves, such as electricity, or other utility type bills. The third cost centre could be associated with the ongoing maintenance and upkeep of the household to preserve the integrity of the home in providing comfort in addition to the more basic shelter elements. The focus of this paper is on the second of these categories by looking at revenue generating or cost reducing strategies that may directly offset rising utility costs.

Utility bill prices represent an critical component of owner occupier costs but remain largely outside the realm of what the ordinary householders directly control. Moreover, the likely future trajectory of utility pricing is anticipated to be quite high, especially in the more recent lower inflationary environment where cost plus regulated utility returns remain the default consumer pricing model. Thus, in a lower interest rate environment such expenses are likely to become a more significant element of total housing cost. Indeed, the Environmental Protection Agency (EPA, 2008 and 2009) forewarns for example that investment in U.S. drinking water infrastructure improvements for 2017-2027 alone will cost a third of a trillion dollars, all of which must be paid for via higher utility billings. Given the soaring costs of utilities that continue to rise year after year due to regulatory imposed increases based on infrastructure CAPEX and energy efficiencies, prudent homeowners should carefully weigh up ancillary household investments as direct substitutes for utility provision. This should promulgate reduced ongoing billings and thereby all the householder to mount a defence against foreseeable future utility costs increases and thereby enhance their own future free cash flows.

Whenever making home improvements, such as for example the decision to install solar panels on your roof, it is also important to evaluate how they will impact a home's final sales price (Dastrup *et al.* 2012). In multiple studies by the Lawrence Berkeley National Laboratory (LBNL), a research laboratory funded by the U.S. Department of Energy, sales data have shown that solar can improve the value of your home significantly. According to Adomatis and Hoen (2015) analysis of sales of solar photovoltaic (PV) homes within eight different states over 11 years, on average, homebuyers were "consistently willing to pay premiums for PV installation homes" of approximately $4 per watt of installed solar capacity. This means that for a standard 10Kw solar system, a $40,000 home appreciation would result (Hoen *et.al.* 2011, 2015). Tax breaks and other incentives drastically reduce the true post installation cost, given the benefit of the immediate 30% Federal solar tax credit that reduces taxes paid by the home owner in the filing year (and can be carried forward), reducing total net solar installation costs further.

We note that the costs to install such larger sized domestic systems are now falling below $3 per watt, due to size ranged economies of scale becoming even more pronounced (Black 2009). This means that inclusive of the tax break the benefits based on the Hoen *et al.* (2014) analysis could suggest up to 100% return in after tax dollars for new solar installations in respect of prospective future home sales. Increased property value is of course merely one component of solar's financial return,





as householders should also consider the investment based on reducing ongoing monthly electricity bills, as well as the householder's impact on the environment by producing emissions-free electricity for the home.

Admittedly in the light of recent tax changes, including raising the standard deduction and thereby reducing the deductibility of other items such as mortgage interest and property taxes, the incentive pendulum appears to have swung more favourably in respect of solar incentives for new systems, given the receding availability of alternative tax benefits to home ownership. Moreover, in addition to the tax credit incentive that lowers the upfront investment appreciably, whenever a solar electric home is sold the seller is likely to recover such costs and appreciably more according to Hoen *et al.* (2013). This ignores the direct ongoing cashflow benefits of lower operating costs in the form or utility bills on the home whilst the property is in occupation. In fact, the incentives are so significant, that many solar financing options are now available at low-interest, and many require zero money down, in large part because the gain is sufficiently large to be shared over a long-time horizon.

Most importantly, householders may reduce or even eliminate their electricity bill altogether when they live in a solar-powered home, deriving a triple net positive NPV, due to ongoing reduced outflows in the form of lower utility bills on the installation, increased sales prices and net metering reimbursement payments. Solar panels save money both in the short term, and more importantly protect the home owner from increasing utility rates for the 20+ years that they are often guaranteed to continue to generate electricity. When making these NPV calculations however we typically look at what current utility rates are in determining the anticipated future financial outcome, but this ignores any prospective real increases in utility billings which suggest any such repayment estimates will most likely under represent true returns attainable by investors. Modern solar panels are likely to have life spans well beyond the stated 20 years at installation, although the efficiency of the conversion capabilities of the panels themselves, alongside the invertors or optimisers will likely degrade over time. Moreover, the advent of newer technologies may be anticipated increase the energy conversion efficiency rate on replacement panels etc, making it more likely that these consumable items could be worth upgrading (in terms of their incremental cashflow generation) prior to their useful life expiration.

The downside to the installation process is that it is more complicated than other typical home improvement projects, involving skilled tradesmen such as a master electrician, alongside permitting and utility interoperating agreements and inspections. Unlike a disruptive home remodelling project however, solar can typically be installed within a couple of days even for the larger systems. From a financial standpoint, home equity lines of credit (or HELOCs), can be used to go solar, although the interest deductibility previously available under this option has recently become more limited due to the Tax Cuts and Jobs Act of 2017. Notwithstanding these tax reforms the tax break remains in respect of interest paid on HELOCs according to the IRS (2018), providing it is being used for improvements to the home. It should be noted that these provisions can still be used as relatively inexpensive forms of borrowing to make these and other updates to a property providing the total interest deduction claimed can be no more than $750,000 of debt for married filing jointly, or $375,000 for single filers, and that total loans may not exceed the value of the home.

## Solar As An Investment

When considering different sources of potential income associated with a home, some of these can offset different cost centres. In the case of utility bills there are various forms of income derived from alternative energy sources that have an initial cost, but when viewed as investments, have a much more consistent payback over the long run. For example, the cost of solar energy can be as low as $1 dollar per kilowatt and installed equipment falls in the range of $2 to $3 per kilowatt. For a typical 10 kW array installation it may cost somewhere between $25,000 and $35,000. This array could generate somewhere between $250 and $350 a month in electricity depending on how the array is oriented and how effectively it gets sun versus shading, or how often the sun appears over the array. This can yield somewhere between $3,000 and $4,000 of annual income, if net metering can be arranged. On the initial investment this is between 10% and 12% per year, half of which is from the electricity generated versus utility costs, and the other half from the various cost recovery and fuel surcharges and transmission costs imposed by utility operators.

However, at present the US government offers a one-time rebate associated with an array of 30% of the installation costs, lowering the overall out-of-pocket expense by 30% on a retrospective tax rebate basis against an individual's prospective tax return. This effectively raises the annual rate of return on investment. From a net present value perspective, payback should be less than 10 years and, in most cases, solar arrays and equipment are warranted for at least 20 years or more. When contrasting the payback of the solar array to a typical investment, the former guarantees a higher rate of return for a consistently longer period – in essence the solar income behaves as if the investor had purchased an inflation protected bond, reflecting the likely trajectory of utility costs. Moreover, the payback window is constantly receding partly due to falling solar panel prices (recent import tariff imposts notwithstanding) and other direct input costs, but also due to the ever-rising utility costs themselves which are effectively making solar an even better incremental return versus static calculations typically undertaken at time of installation. Furthermore, should the future of the automobile prove to be in the direction of electric vehicles, which it appears

to be, then a simple adaptation of a domestic solar array output could become a prospective form of subsidised transportation for the householder.

We now consider the power utility portion of the homeowners cost frontier representing a combination of outgoings from the operation of the household and associated utility demands required, versus revenue from net metering or other forms of power generation that offset these costs and in more extreme cases provide positive net income generation.

$$\text{Let } U = U_i - U_c \tag{1}$$

Where $U_c$ represents utility cost and $U_i$ represents utility income.

The homeowner would be best served if they could maximize U which involves either maximizing $U_i$ or minimizing $U_c$ or some combination. However, power utilities have created many barriers that prevent homeowners from generating high levels of direct income. In many cases nationwide utility companies have managed to convince the local legislature to lower the revenue due to the homeowner once it exceeds their direct consumption. This effectively places a ceiling on the homeowner's upside potential. If the homeowner installed for example the 11.6 kW maximum array size (based on a tier 1 installation) and that effectively eliminated their electric bill altogether, any additional electricity generated beyond what is utilised would be compensated at less than half the income paid against the first portion of actual consumption. The downside to such a large system is that it makes the cost of installing additional solar panels beyond the base load required to run the home, a drag on marginal income generation which implies a slower payback. Ironically, power generation that is not consumed by the installing homeowner invariably flows to homes of proximate neighbors who will not discern the difference between power generated from the roof of their next-door neighbor, at half the rebate cost versus fully priced power generated miles away from a substation that is powering their local neighborhood.

Given the localised demand and likely net consumption patterns observed across local substation networks, the argument that solar or alternative energy generation creates powerline issues is likely more of a red herring argument than a real problem for utility companies. Ironically, utilities often complain about load issues during peak periods, such as high loads in winter time with electric heating and high loads in summer times with electric cooling. Most homeowners would notice that after the first MW of electricity is consumed the cost of power goes up markedly. In fact, utility companies have an objective to minimize U by minimizing $U_i$ or maximizing $U_c$. The major objection raised by utilities to minimize $U_i$ is that it makes homeowners essentially their own micro power station, and if enough homeowners did that it would be competitive with the more monopolistic power of the utility company. However, the reality of the situation appears somewhat different given the free rider problem since the electricity actually consumed by adjoining neighbors is being bought in at half the cost by the utility company via the adjacent generator, than it is being resupplied to them, thereby reducing the aggregate marginal demand for centralized power station provision. Thus, the homeowner's financial objective will be to Max U, whilst the utilities objective will be to Min U.

## Ancillary Investment Opportunities

Carbon credits represent another opportunity for homeowners to monetize their production of electricity. However, in 2010 the uncertainty of the future of tradeable carbon credits caused the carbon market associated through CCX to crash. Furthermore, carbon credits are traded in some states but not in others. This creates odd distortions in the market and makes carbon credit trading more of a state specific phenomenon. In short there is too much variability in the carbon credit market at present for it to become a reliable source of income for homeowners who wish to increase their returns on the alternative investment.

Another source of cost to the owner-occupier however is water and sewage bills.

$$\text{Let } W = W_i - W_c \tag{2}$$

Where $W_i$ = Water / sewage income, and $W_c$ = water sewage costs.

$W_i$ would represent any income that could be created by homeowner-generated water. $W_c$ represents any costs imposed on homeowners for water consumption and sewage production. According to the US Geological Survey each person uses about 80-100 gallons of water per day, with the average American family using more than 300 gallons of with roughly 70 percent of this use occurring indoors. Nationally, outdoor water use accounts for the remaining 30 percent of household use yet can be much higher in drier parts of the country with typically more water-intensive landscapes. Unlike the case of electricity which comes from power utility monopolies, water consumption W, is often dealt with by local municipalities. While a sizeable portion of the community's revenue may derive from water and sewage bills charged monthly to homeowners, the cost is





substantial to the community as a whole and it is not clear whether these municipalities generate a significant profit when costs are fully examined. Thus any cost savings that the consumer can arrive at may lead to a commensurate reduction in costs that the community bears to the water supply function. It is therefore legitimate to enquire how a homeowner might go about generating an income or cost reduction strategy in water and sewage?

In many cases small investments in guttering on the dwelling itself can divert rain water, which is otherwise destructive to the frame of the house and its foundation, to locations which are not harmful to the house and to water plants and lawns adjacent to the property. Cistern and water collection vessels can be quite simply integrated into the downspout system of the gutters, using gravity and retention facilities to water the outside space. These systems can cost $2,000 to $4,000 to install and will subsequently reduce water consumption for grey-water needs such as lawn or plant watering. This is environmentally far more beneficial than the use of treated water for irrigation purposes. Moreover, this could be supplemented with well water in areas of acute irrigation need such as Florida, or by the use of electric pump and additional storage vessels either above or below ground. Importantly it would also reduce sewage costs as water that had previously been drawn from the mains via the domestic meter is no longer being drawn from the main water supply which typically costs the householder around 3 times the direct cost of the water itself, by the time the sewage diversion rate (which is often a multiple of the supply costs) is also taken into account. In many cities water consumption is usually how water sewage is directly measured, even if in reality a portion of it is lost through evaporation and ground penetration or natural drainage. Thus, a reduction in water consumption will directly lead to a reduction in overall sewage charges as well, magnifying the savings.

Typically, in Florida for example the majority of water consumed in a household with external irrigation could well end up be consumed by the irrigation system itself. If the plants and lawns were fed with diverted water instead of treated water, such an approach could potentially cut water bills dramatically. Depending on water consumption rates associated with irrigation within each region, a typical end user based on a 50% irrigation use in Florida would face savings of a mere 150 gallons per day in irrigation cost. At current utility rates of $7 per gallon for water and sewerage including utility taxes, this could save a typical homeowner $35 or more a month or over $420 a year. The implied payback is under 10 years of operation, with a return exceeding 10% even on the most expensive water retention systems costing up to $4,000 for the average home, which would outpace many other forms of investment in today's low interest rate environment. Considering water bills are a constant monthly outlay, and likely to rise in the future given the dire EPA forecasts, these savings represent an immediate and ongoing monthly reduction in costs and thereby generating potential future increases in disposable income.

There are other investment opportunities with which to save money in respect of other bills, which accrue to the household (see Dastrup *et al.* 2012). Each of these can be categorized as active or passive savings, such as improved insulation that has a hard dollar return associated with it, given these are regular outflows of cash to the household (for heating and cooling), just as a business would have regular outflows related to overheads. However, unlike a business, where outflows related to overhead can bankrupt a company due to competitive concerns, homeowners have no such competitive issues. In addition, these cost decreases are stable over the long run and when paired with regular utility increases, can yield higher returns as these increases are passed on to consumers. Consumers who have done all these kinds of improvements will not feel the cost increase nearly as much as their neighbours who have not. However, the cost increases will lead to higher holistic returns on their initial investment than static individual calculations for each intervention imply.

The next form of investment would be offsets associated with income taxes or real estate taxes associated with the household. Today more and more people are working from home offices and from the perspective of being an independent contractor rather than an employee. The home office has taken the place of the crowded office work cubicle. As a result, some of these taxes may also be hypothecated as deductible business expenses.

$$\text{Let } T = T_c - D_p - D_d \tag{3}$$

Where T represents the portion of costs associated with taxes. $T_c$ represents the total cost of real estate taxes without any tax breaks. $D_p$ equals depreciation expense on the business element which is a source of cash for the homeowner in the short run. However, in the long run at the time of sale, the cost basis will be reduced by the depreciation amount the homeowner has already taken. $D_d$ represents any other deductions that the homeowner is entitled to beyond the aforementioned ones. Thus, the offset on income to business expenses is one that might yield tax mitigation effects in the longer term. In such cases traditional maintenance costs to the householder may also qualify as an operational expense item associated with homeworking such as is becoming more prevalent with a distributed workforce. Moreover, it should be noted that the installation of solar panels effectively shields the roof from an element of environmental degradation and is therefore likely to be extending the useful life of the roof covered by those panels, with commensurate reductions in maintenance expenditure for re-roofing over time.

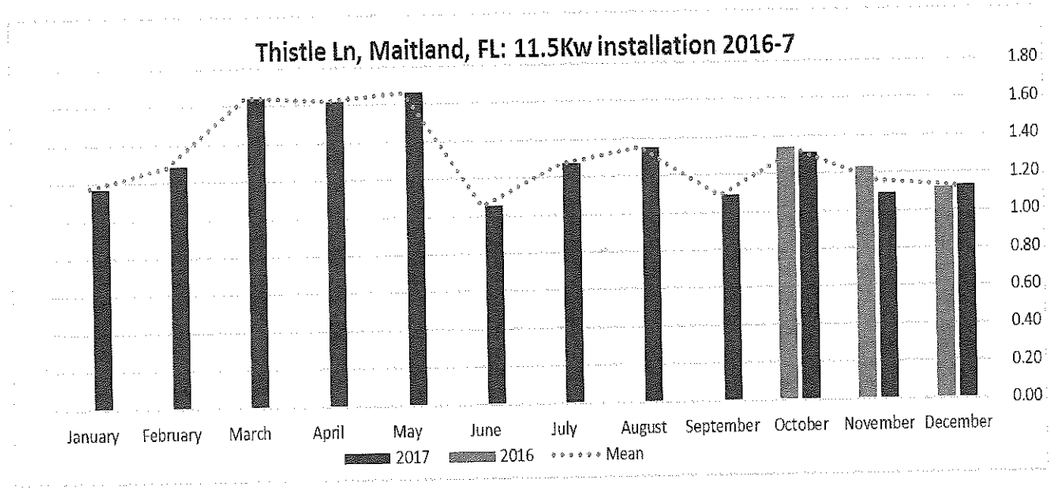
## Solar PV Installations in Central Florida

We now consider our two separate 10kW installations within Central Florida to determine the likely payback to owners based on case study data. An efficiently located 10-kilowatt solar (photovoltaic, or PV) system can generate the equivalent of a typical household's annual electricity use. Whilst smaller systems are feasible, these typically operate below the minimum efficient scale, without breaching the limitations typically imposed on tier 1 installations. The tier 1 calculation imposes higher insurance charges for generation beyond 10kW net installed. The tier 1 regulations are imposed by local utility companies, who for safety reasons limit the maximum generation capacity in the local supply loop to avoid injury to line engineers working in the field, and generally require additional homeowner coverage of typically $1m plus liability insurance to exceed these generation limits.

**Table 1: Energy Production at Thistle Ln, Maitland, 11.5Kw system**

| Year | Dec. | Nov. | Oct. | Sept. | Aug. | July | June | May | Apr. | Mar. | Feb. | Jan. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | 1.13 | 1.09 | 1.31 | 1.09 | 1.35 | 1.27 | 1.05 | 1.66 | 1.62 | 1.64 | 1.28 | 1.17 |
| 2016 | 1.12 | 1.23 | 1.34 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| **Mean** | **1.13** | **1.16** | **1.33** | **1.09** | **1.35** | **1.27** | **1.05** | **1.66** | **1.62** | **1.64** | **1.28** | **1.17** |

**Figure 1:** Energy Production at Thistle Ln, Maitland, 11.5Kw system




There is a 0.85 efficiency factor used to allow for DC-AC conversion, meaning that the largest tier 1 compliant installation would be no greater than 11.76kW (or 10kW/0.85). Note however that actual installations cannot breach this tier 1 figure they will necessarily be downgraded to meet the nearest whole panel generation capacity, based on available roof space and the type rating of the panels in question, so maximum tier 1 generation systems will effectively range from between around 10kW and 11.76kW of actual installed capacity

**Table 2:** Energy Production at Carolina Wren Dr, Ocoee, 9.9Kw system

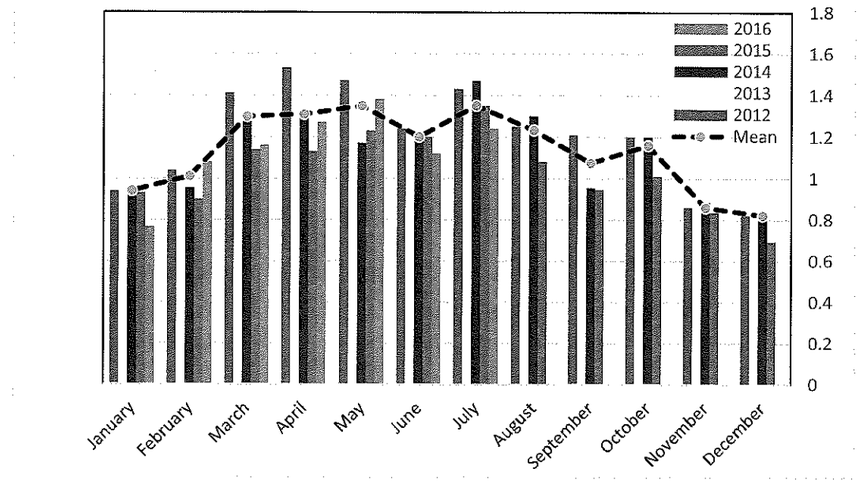
| Year | Dec. | Nov. | Oct. | Sept. | Aug. | July | June | May | Apr. | Mar. | Feb. | Jan. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2016 | n/a | n/a | n/a | n/a | n/a | 1.24 | 1.12 | 1.38 | 1.27 | 1.16 | 1.08 | 0.77 |
| 2015 | 0.69 | 0.84 | 1.01 | 0.94 | 1.08 | 1.35 | 1.20 | 1.23 | 1.13 | 1.14 | 0.90 | 0.93 |
| 2014 | 0.80 | 0.89 | 1.20 | 0.95 | 1.30 | 1.47 | 1.20 | 1.17 | 1.31 | 1.28 | 0.96 | 0.92 |
| 2013 | 0.97 | 0.86 | 1.23 | 1.19 | 1.30 | 1.26 | 1.24 | 1.49 | 1.30 | 1.50 | 1.08 | 1.15 |
| 2012 | 0.82 | 0.86 | 1.20 | 1.21 | 1.25 | 1.43 | 1.24 | 1.47 | 1.53 | 1.41 | 1.04 | 0.94 |





| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | **0.82** | **0.86** | **1.16** | **1.07** | **1.23** | **1.35** | **1.20** | **1.35** | **1.31** | **1.30** | **1.01** | **0.94** |

**Figure 2**: Energy Production 2012-2016 Carolina Wren Dr, Ocoee, Fl




## Householder Model for Reducing Fixed Costs

The traditional accounting identity is: $A = L + E$ (4)

where A = assets, L = liabilities, E = equity

Furthermore, $P = R - C$ (5)

where P equals profit, R = revenue and C equals costs.

For the household the cost associated to homeownership are Taxes, Operating Expenses, Maintenance, Mortgage.

$$\Delta\text{Asset} = \Delta\text{working capital} \quad (6)$$

C can be rewritten for the homeowner as:

$$C\text{-}\ t_c + u_c + w_c + m_c + m_{oc} \quad (7)$$

where $t_c$ = tax costs, $u_c$ = utility costs, $w_c$ = water and sewage costs, $m_c$= maintenance costs, $m_{oc}$= mortgage costs.

Thus minimizing any one of these cost elements would lead to a change in working capital for the home. These reductions in costs through the home improvements we have discussed, can result in an ongoing change that will ultimately yield high returns based upon the initial investment. That can be seen through the maximization of R or revenue.

$$\text{Max } R = D_p + D_{dp} + u_i + w_i \quad (8)$$

$$\text{So } P = \text{Max (R)} - \text{Min (C)} \quad (9)$$

$$\text{Costs} = \text{Operating Offsets} + \text{Offset Tax} \quad (10)$$

Thus, the household would create a more sustainable and more profitable operating profile. Costs would be minimized over the longer term and the household would go from being a cost center operationally to potentially a profit center. Even if the household did not become cash flow positive, every dollar reduction in costs would increase funds available in household operations and release homeowner funds for other purposes. Unlike many one-off rebates, these changes would be impactful in the long run and thereby help the homeowner build their equity in the property or wealth in the event there is little or no debt remaining on the home. Homeowners could conceivably get to a point where the cost of the household could become net zero and eliminate the risk of losing a property due to job loss or unemployment. This could make the home truly the "Castle" that provides refuge from any economic storm.

## Conclusions

Reductions in technology costs, a proliferation of financing options, and an increasing raft of solar installers and financial intermediaries have contributed to drive down prices for such a household system in the United States. PV pricing has also benefitted from reductions in "soft" costs, such as those related to sales, permitting, inspection as well as connectivity to the electricity grid. Third-party ownership options, under solar leases or power purchase agreements, require electricity consumers to pay virtually nothing up front for rooftop systems, then obtain electricity from these systems for an extended period often at attractive fixed rates. The systems and requisite maintenance responsibilities at the property are retained by the project developers. Rooftop solar is thus increasingly a cost-effective investment for home owners. Specifically, we considered two separate 10K installations within Central Florida to determine the likely payback to owners based on our case study data. Based on our findings we can conclude that an efficiently located 10-kilowatt solar (photovoltaic, or PV) system can generate the equivalent of a typical household's annual electricity use. We also explored alternative interventions available to householder that could reduce the cost function of operating a particular home. Many of these are also NPV positive based on a static calculation and are likely to prove even more so given the likely trajectory of local utility rates nationwide.

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# *Benefits of Commonwealth*

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## Abstract

This research paper breaks down the benefits of having affiliation in the Commonwealth. These benefits are examined by addressing each of the Commonwealth nations' growth rates over the last five years, with each variable of the Gross Domestic Product (GDP) model. The results will compare the Commonwealth member nations against the Organization for Economic Co-Operation and Development (OECD) nations. The outcomes of this conducted study show that Commonwealth nations experience a larger average per capita GDP growth.


## Introduction

There is speculation of whether Commonwealth nations truly benefit from being in the Commonwealth organization. When assessing the intergovernmental organization memberships, there is an ongoing issue on how to measure those benefits. In this article, there are calculations created based on a cross-sectional regression model analysis that incorporates the standardized growth rates through multiple variables pertaining to the GDP formula. These calculations show why Commonwealth nations are benefited by their affiliation to the Commonwealth, when compared to the OECD nations. The Commonwealth was established in 1931 by Queen Elizabeth II. It is comprised of 52 member states, with many of these nations being previous territories of the British Empire. It has been many years since the establishment of the Commonwealth, which renders the question: is the Commonwealth still relevant and beneficial in modern-day? The research conducted in this article, and the results it produces, show how the Commonwealth nations benefit from their membership. Unlike many other trade organizations, the Commonwealth has experienced increased expansion in their average per capita GDP. This fact was obtained using a calculation that includes the following variables: consumptions, investments, government spending, exports, and imports. When compared to the Commonwealth nations' results, the OECD countries have experienced a decline in their overall average per capita GDP, based on calculations using the aforementioned categories. This study will assess how the Commonwealth countries have a higher overall growth rate for their average per capita GDP over a five-year time horizon.

## Hypotheses

According to the GDP equation, money spent on a nation's consumptions, investments, government spending, exports, and imports need to be taken into account. Without assessing each variable independently and how they correlate to each other, a conclusion regarding the average per capita GDP cannot be made. The study will examine five hypotheses regarding potential reasons behind the higher average growth rate in per capita GDP of Commonwealth nations. The five $H_o$ (null hypotheses), and $H_1$ (alternative hypotheses) are as followed:

$H_{oC}$: $B_C = 0$ Consumption growth rate will not affect nations per capita GDP.
$H_{1C}$: $B_C > 1$ An increase in the Consumption growth rate will increase nations per capita GDP.

$H_{oI}$: $B_I = 0$ Investment growth rate will not affect nations per capita GDP.
$H_{1I}$: $B_I > 1$ An increase in the Investment growth rate will increase nations per capita GDP.

$H_{oG}$: $B_G = 0$ Government spending growth rate will not affect nations per capita GDP.
$H_{1G}$: $B_G > 1$ An increase in the Government growth rate will increase nations per capita GDP.

$H_{oX}$: $B_X = 0$ Export growth rate will not affect nations per capita GDP.
$H_{1X}$: $B_X > 1$ An increase in the Export growth rate will increase nations per capita GDP.

$H_{oM}$: $B_M = 0$ Import growth rate will not affect nations per capita GDP.
$H_{1M}$: $B_M < 1$ An increase in the Import growth rate will diminish nations per capita GDP.





In each of the above circumstances, the $H_o$ (null hypotheses) finds that each variable will not influence a nation's per capita GDP. The $H_1$ (alternative hypotheses) for the consumption, investment, government spending, and export variables will have a positive correlation regarding the GDP for each nation. Because consumption is such a large component of GDP, it has an immediate impact. With every dollar that consumption rises, the GDP will increase by the same value (Dornbusch, 2008). Investments, government spending, and exports have the same positive correlation as consumption to the GDP. Imports will have an inverse effect upon the GDP, due to the reduction of the net export variable. It is paramount to consider these variables as they affect the overall outcome of the GDP.

## Data and Statistics

Data for this study was drawn from the World Bank's Datasets (World Bank). For this study to be up to date, the data was selected from Fiscal Year (FY) 2012 to FY 2016, which gives the study a five-year time horizon. Instead of using panel data, the analysis uses cross-sectional data to eliminate short-term seasonality or cyclical fluctuations. Thus, the research averages each nation's growth rate for each variable into one standardized growth rate.

Due to the lack of data submitted to the World Bank by smaller Commonwealth nations, they have been omitted from this study. See Appendix Table 2 for the list of the excluded Commonwealth nations. Therefore, 34 of the 52 Commonwealth nations are included and assessed in the study.

Since some of the OECD nations are also Commonwealth countries, they have been removed from the data bank for the study. See Appendix Table 4 for the list of the countries who were omitted from the OECD regression.

Listed below are two tables holding key summary statistics for Commonwealth nations and OECD nations used in the regression model.

**Table 1: Summary Statistics - Commonwealth**

| *Variable* | *Mean* | *Median* | *Std. Deviation* |
|---|---|---|---|
| Per Capita GDP | 14.587% | 16.414% | 0.09167 |
| Consumption | 1.088% | 1.982% | 0.19741 |
| Investment | -1.967% | -3.489% | 0.27102 |
| Government | 7.984% | 2.143% | 0.27233 |
| Export | -7.100% | -6.579% | 0.20452 |
| Import | -11.047% | -13.293% | 0.13159 |

**Table 2: Summary Statistics - OECD**

| *Variable* | *Mean* | *Median* | *Std. Deviation* |
|---|---|---|---|
| Per Capita GDP | -3.634% | -6.274% | 0.13241 |
| Consumption | -4.479% | -7.322% | 0.11128 |
| Investment | 0.676% | -5.105% | 0.29792 |
| Government | -2.858% | -5.131% | 0.12330 |
| Export | -2.580% | -3.907% | 0.15380 |
| Import | -5.317% | -6.188% | 0.14914 |

## Methodology

One of the most beneficial aspects of remaining in the Commonwealth is that member nations have experienced an average growth rate increase of 14.59% in per capita GDP in recent years (FY 2012-2016). The data suggests that there will continue to be a positive average GDP correlation in the Commonwealth nations when compared to the non-Commonwealth nations. The GDP model is as follows:

$$Y \equiv C + I + G + (NX) \quad (1)$$

Where (Y) is the Gross Domestic Product, (C) is the household consumption in US$; (I) is the gross capital formation in US$; (G) is the government consumption expenditures in US$; (X) is the export of goods and services in US$; and (M) is the import of goods and services in US$.
The analysis is conducted within a five-year time horizon, including the growth rate for each variable in the model. The cross-sectional data method mentioned in the *Data and Statistics* section of this article was used to collect this data. These calculations display the averages of each nation's growth rate, such as the equation for Consumption below:

$$GRNC = \frac{C_t - C_{t-1}}{C_{t-1}} \quad (2)$$

In the illustrated equation, *GR* stands for the cross-sectional growth rate, using *N* to signify a given nation and *C* to signify the nations consumption variable. $C_t$ is the consumption in the most current year (FY 2016), and $C_{t-1}$ is the consumption in the first year used in this study (FY 2012).
The cross-sectional regression analysis was used with standardized growth rates of the included Commonwealth nations. This method was used to assess the hypotheses of the variables that substantially contribute to the Average Per Capita GDP growth. The regression model formulation is defined as:

$$Y_{Npc} = \beta o + \beta_{Consumption} + \beta_{Investment} + \beta_{Government} + \beta_{eXport} + \beta_{iMport} + \varepsilon_{Npc} \quad (3)$$

Where $Npc$ is a nations per capita GDP, $\beta o$ is the constant value of the intercept; $\beta_C$ is the household consumption variable; $\beta_I$ is the investment variable; $\beta_G$ is the government expenditure variable; $\beta_X$ is the variable for the amount of goods and services exported; $\beta_M$ is the amount of goods and services imported in to a nation; and $\varepsilon_{Npc}$ to signify the error specific to the observation. The regression analysis covers FY 2012 to FY 2016. The population consists of 34 of the 52 Commonwealth nation, due to insufficient data submitted to the World Bank from smaller member nations.

## Results

After running the regression analysis for Commonwealth nations, most of the variables resulted with low importance to the GDP variable due to having a high *P-value*, except for the Exports. The Export variable ($p < 0.041$) is statistically important with a coefficient of 0.168. This means that with each additional 1% increase in average per capita GDP's growth rate, a nation experiences a 16.8% increase in Exports.

**Figure 1**: Regression of Commonwealth Nations

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* |
|---|---|---|---|---|
| Intercept | 0.1264006 | 0.0206825 | 6.1114868 | 1.357E-06 |
| Consumption | 0.1016866 | 0.0989511 | 1.0276449 | 0.3129131 |
| Investment | 0.1212667 | 0.0714759 | 1.6966095 | 0.1008621 |
| Government | 0.0833507 | 0.0730161 | 1.1415378 | 0.2633152 |
| Export | 0.1683401 | 0.0785778 | 2.1423366 | 0.0410042 |
| Import | -0.235783 | 0.1693321 | -1.392429 | 0.1747528 |
| Multiple R | 0.698980692 | | | |
| R Square | 0.488574008 | | | |
| Adjusted R Square | 0.397247938 | | | |
| Standard Error | 0.071172516 | | | |
| Significance F | 0.001419119 | | | |

Unlike Commonwealth nations, there were noteworthy findings in the Consumption, Investment, Export and Import variables. This can be deduced because of the extremely low P-values ($P < 0.00$), as seen in **Figure 2** below. The coefficients of each variable are shown in **Figure 2.** For the average per capita GDP growth rate to increase by 1%, each coefficient must increase by their respective values listed below.





**Figure 2**: Regression of OECD Nations

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* |
|---|---|---|---|---|
| Intercept | -0.017795 | 0.00718935 | -2.4751867 | 0.02044895 |
| Consumption | 0.48393018 | 0.12357479 | 3.91609144 | 0.0006144 |
| Investment | 0.17803207 | 0.03441948 | 5.17242148 | 2.3871E-05 |
| Government | 0.15824027 | 0.10434282 | 1.51654193 | 0.14192642 |
| Export | 0.51113986 | 0.07934389 | 6.44208186 | 9.5659E-07 |
| Import | -0.3694304 | 0.08159388 | -4.5276726 | 0.00012676 |
| Multiple R | 0.97992374 | | | |
| R Square | 0.96025054 | | | |
| Adjusted R Square | 0.95230065 | | | |
| Standard Error | 0.02891935 | | | |
| *Significance F* | 1.1242E-16 | | | |

## Conclusion

As shown within the respective regression models conducted within the analysis, the export variable for Commonwealth nations needs to move at a lower rate in order to generate an increase in their growth rate. However, OECD nations have to anticipate much larger growths in their variables (with exception to Investments) to achieve the same 1% growth rate increase. The correlation between the exports and the Commonwealth's average per capita GDP growth rate can be justified because of what many refer to as the *Commonwealth Effect,* which highlights certain favorable factors. These factors are common language (and similar institutions and legal systems), which translates into lower trading costs amongst Commonwealth nations (Razzaque, 2016). Intra-Commonwealth trade benefits have outlined a "19% lower trade cost when trading amongst other Commonwealth nations" (Razzaque, 2016). This is justified by a "strengthening in trade logistics" which in turn "expands trade flows amongst Commonwealth economies" (Razzaque, 2016).

## Acknowledgment

A great thank you goes to Dr. Shahdad Naghshpour for his vast insight and wisdom, which helped to formulate the paper.

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## Appendix

**Table 1:** Commonwealth Nations incorporated in the study.

| | | | |
|---|---|---|---|
| Australia | Ghana | Mauritius | Sri Lanka |
| Bahamas, The | Guyana | Mozambique | St. Lucia |
| Bangladesh | India | Namibia | Swaziland |
| Botswana | Jamaica | New Zealand | Tanzania |
| Brunei Darussalam | Kenya | Pakistan | Uganda |
| Cameroon | Lesotho | Rwanda | United Kingdom |
| Canada | Malawi | Sierra Leone | Zambia |
| Cyprus | Malaysia | Singapore | |
| Fiji | Malta | South Africa | |

**Table 2:** Commonwealth Nations not incorporated in the study due to lack of data.

| | | |
|---|---|---|
| Antigua and Barbuda | Nauru | Seychelles |
| Barbados | Nigeria | Solomon Islands |
| Belize | Papua New Guinea | Tonga |
| Dominica | Saint Kitts and Nevis | Trinidad and Tobago |
| Grenada | Saint Vincent and the Grenadines | Tuvalu |
| Kenya | Samoa | Vanuatu |

**Table 3:** OECD Member nations in the study, excluding Commonwealth nations within the OECD.

| | | | |
|---|---|---|---|
| Austria | Greece | Luxembourg | Sweden |
| Belgium | Hungary | Mexico | Switzerland |
| Chile | Iceland | Netherlands | Turkey |
| Czech Republic | Ireland | Norway | United States |
| Denmark | Israel | Poland | |
| Estonia | Italy | Portugal | |
| Finland | Japan | Slovak Republic | |
| France | Korea | Slovenia | |
| Germany | Latvia | Spain | |

**Table 4:** OECD Member nations that are also Commonwealth nations.

| | |
|---|---|
| Australia | New Zealand |
| Canada | United Kingdom |

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