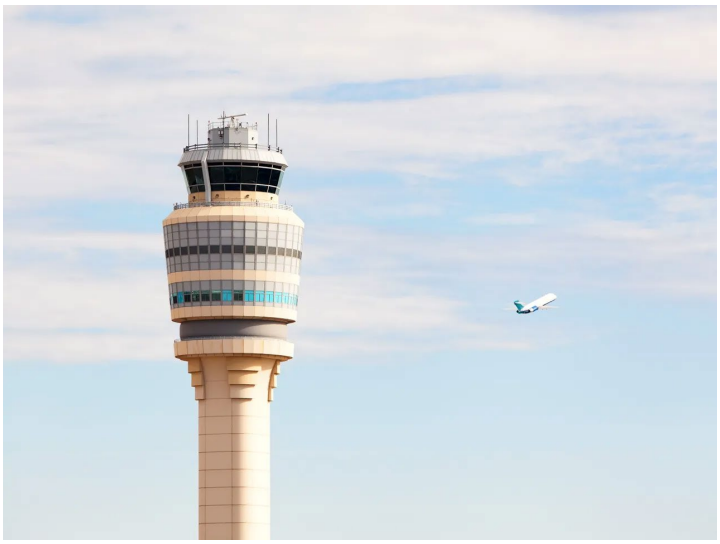

Discount Rate Impacts on Private and Public Sector Capital Investment Valuation

Analytical Methods – ICEAA Workshop 2025

ABSTRACT

The public and private sectors have different valuation techniques, motivations, and considerations when evaluating capital budgeting decisions. Understanding the difference between private and public sector capital investment analysis – discounted cash flow, cost/benefit considerations, nominal/real discounting, stakeholders, and cost of capital – helps decision-makers make better informed decisions. In 2023, the OMB updated its Circular A-94 with new nominal and real discount rates, significantly reducing the real discount rate for cost-benefit analyses. This could have unintended consequences in project valuation when including private sector stakeholders who traditionally have a higher cost of capital. In this paper, we explore the major differences in valuation, stakeholder motivations, and discount rates in public and private sector investment decisions and the impact of inflation. Understanding value drivers in both sectors is important for the cost estimating community and makes us more effective Finance professionals.

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Cobec, Inc. – February 17, 2025

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1 Introduction

In Oklahoma 20 years ago when a major energy company was evaluating power supply options for a refinery with an aging boiler system, the company considered organic legacy replacement, buying power from the grid, or introducing some creative variation of cogeneration to the refinery where excess power could be resold to the power grid. The largest challenge was understanding the value proposition for not only the refinery but also the third parties who would be providing a service or building a cogeneration power plant. As the economist for that project, I developed multiple cost estimates and discounted cash flow (DCF) models in order to compare the value proposition for the energy company and refinery, accounting for commodity price risk, fuel prices, and the volatile price of electricity. I also interpreted the value proposition to vendors proposing a power generation option. The lack of financial transparency to these third parties (cost of capital, acquisition costs, tax structure) required an understanding of the industry, private sector stakeholders, and potential value drivers in order to calculate an accurate cost estimate and valuation model.

Similarly, 10 years later, when evaluating major capital investments at the Federal Aviation Administration (FAA), I was challenged to understand the distinction between how value is measured in the federal government versus how it is measured in the private sector. For government acquisitions, value is measured to multiple stakeholders, in this case the flying public, airlines, and the FAA. Each stakeholder has specific interests, and measuring those value propositions is not as straight-forward or standardized as calculating sources of revenue and cash flow in the private sector. Financial analysts in the public sector must measure value to the common good, incremental efficiencies afforded to the private sector, and greater efficiencies or cost avoidance to the government.

Today, with major fluctuations in inflation and the cost of capital, cost estimators need to better understand government and corporate discount rates to properly calculate the net present value (NPV) of investments and government acquisitions. For capital infrastructure projects that benefit the government and private sector, how do we know the proper discount rate that accounts for both public and private costs of capital? In Circular A-94, the OMB recently changed the guidance on discount rates for capital projects, significantly reducing this blended discount rate. Considering higher inflation and increasing private sector cost of capital, does this new discount rate accurately assess present value cost? If not, how can cost estimators utilize alternative discount rates to properly estimate value, compare projects, and account for interest rate risk?

When evaluating major capital investments, the public and private sectors use distinctly different valuation techniques, are motivated by different value drivers, and consider a wide variety of interests and stakeholders. Understanding the drivers of value in private and public sector capital investments, accounting for inflationary risk, and applying accurate project discount rates helps analysts improve cost estimates and government leadership make better informed decisions.

2 Culture

In the private sector, business development groups become the primary source of new capital investments. Companies grow organically by expanding existing operations, increasing market share, or by investing in new projects. Within business development, companies focused on organic growth invest capital for new ventures within their existing area of expertise, and they evaluate those investments according to calculated or pre-determined hurdle rates. A company often asks, "Is this investment worth it?" That value proposition is determined by financial metrics, the company cost of capital, the potential revenue and cost of the project, and the strategic impact the project has on the company as a whole. Unforeseen cultural influences impact capital investment value and selection, and a greater understanding of these influences can help increase transparency and better align strategic goals.

The public sector makes capital investments for a variety of reasons, but, primarily, these investment decisions are the result of (1) adding new value to the agency, the general public, and/or industry, (2) complying with a government Executive or Congressional Order, (3) sustaining agency, industry, or government existing infrastructure, (4) creating an efficiency within the government that does not exist today, or (5) reacting to a concern in the public's best interest (safety, security, hazard avoidance, providing a public good, alleviating a public burden, etc.).

A closer look within the motivations and cultural influences that define public and private sector capital investments reveals large distinctions between the two groups. Some of these distinctions manifest as hurdles in investment analysis. Others provide insight into the primary recipients of capital investment value. Better awareness of the motivations and investment decision influences within both the public and private sector would allow managers to adjust policies to make better investment decisions with limited capital budgets. Similarly, insight into the corporate business development culture can help executives better align strategic objectives with new portfolios of capital investments.

Understanding these nuances between capital investment culture within the public and private sector allows individual investors and the Finance community to properly evaluate the different investment projects, manage expectations, anticipate project cost, and plan for the challenges they are likely to encounter.

2.1 Cultural Influence within Public Sector Acquisition Management

Within the government, capital investments progress through an intricate and well-defined acquisition regulations and process with multiple checks and balances related to the program engineering and system design, requirements development, shortfall quantification, and cost and benefits quantification in order to justify the investment. Specific research and development, systems engineering, and operational groups within the agency are tasked with developing new investment ideas, creating alternative solutions to infrastructure problems, and converting new technology programs into business cases. At some point during the process, these creative organizations hand-off the capital investment business case to a Program Management Organization (PMO), which shepherds the business case through the investment analysis process and through program implementation. Once this transition is made, the agency focus shifts from idea generation to program execution.

Program managers assume the responsibility of navigating the acquisition process with program performance tied to successful investment decisions. Within the government, the program manager

focuses on achieving investment process goals, demonstrating leadership of acquisition and implementation teams, and achieving a favorable investment decision within a predetermined timeframe.

Unlike the private sector, public sector program managers are not rewarded with financial incentives based on the outcome of their programs. While there are financial incentives tied to milestone achievements and annual goals, they are limited. Public sector program managers are motivated by more philanthropic rewards. The public sector serves the public good, and business case benefits in the government are measured less by benefits to the sponsor agency and more in how beneficial they are to the government as a whole, private industry, and to the taxpaying public.

Additionally, cost-benefit valuation is not the exclusive means by which public sector capital investments are evaluated. Critical infrastructure programs in the government are often funded to fill a public need, whether or not its financial benefit outweighs required costs. In this way, program managers are less burdened with profitability and near-term project return and, instead, can focus on supporting necessary investments regardless of gross margin.

2.2 Cultural Influence within Private Industry Business Development

In the private sector, business developers assume the equivalent responsibilities of public sector program managers, except they also originate new investment prospects, analyze a portfolio of new prospective programs with a team of engineers and economists, and select the most valuable capital investment prospects to proceed through investment analysis and to be implemented.

Companies, in turn, reward creativity, new ideas, and risk. Business Developers are rewarded for bringing forward valuable capital investment ideas and are not penalized for taking risks or coming up with several ideas that are likely to fail or not be approved. Finding the most incrementally valuable investments and providing the company with a competitive advantage requires determination, creativity and a broad reach, and, most likely, produces several investment ideas that are not valuable enough to bring forward. However, the most successful companies do not punish developers for a few poor investment ideas if they end up investing in a few very valuable capital investments. By finding and identifying the most valuable capital investment options, companies can get the greatest yields from constrained capital budgets, while tabling or discarding less valuable options.

In private industry, the developers' careers are tied to the value their selected capital investment ideas add to the company. They are never encouraged to bring forward an investment idea that does not add strategic, cost-effective, positive Net Present Value (NPV) value.

Large corporations usually have specialized operations teams which help lead capital investment implementation and which lead to continued revenue production. In the private sector, business developers and their teams lead capital investments from conception through investment analysis in a streamlined process, consistent with their peers.

2.3 A Comparison of the Capital Investment Process

For a variety of reasons, the investment analysis duration and process differ dramatically in the public and private sectors. Capital investments in the private sector originate out of a business development department and become a feedstock for future cash flow. Because of a dependency on short-term return on investment (ROI) to sustain cash flow and with a limited timeframe to invest in projects, the

private sector depends on a streamlined investment analysis process. Projects funded this year may need to start producing revenue within a few years to sustain future capital investments. In a competitive landscape, capital investment opportunities are not exclusive to one company, and out of concern of competition, the private sector must act quickly to realize short-term gains from current investments.

Just because the process duration is expedited in private industry does not mean the quality and thoroughness of the investment analysis is compromised. In order to manage the compressed workload, companies often develop cross-functional teams of developers, engineers, economists, accountants, treasury, lawyers, and regional experts. This team approach is especially present in the Energy Industry, where developers and economists are responsible for evaluating dozens of potential capital investments in oil, natural gas, and power in order to narrowly focus on a few highly profitable and strategically aligned business cases.

In the public sector, capital investments are evaluated over a two to three-year period. In the government, the acquisition process is formalized, includes many checks and balances throughout agencies, includes legal concerns centered around competitive bids from the private sector, and, in the federal government, is ultimately accountable to Congress. In addition, a disproportionate number of capital investments in the federal government are large acquisitions ranging from over $10MM to more than $2B. As a result of these additional complexities and reporting structures, government acquisitions require extensive due diligence and longer lead times.

Due to the private sector's dependency on cash flow and ROI, corporate capital investments are usually evaluated and awarded within 12 to 18 months from concept development. In a competitive landscape, where companies which delay investment decisions might concede opportunities to industry peers, the investment turnaround process is critical to corporate success. While a longer process is critical for large and complex government acquisitions where program managers are responsible for accurate cost estimates and have a fiduciary responsibility to the taxpaying public, private sector investments are focused more on cash flow and shareholder return. Extending the investment analysis process in the private sector could come at the expense of project NPV and negatively impact the project cost of capital. Therefore, companies deploy the most efficient and streamlined processes to make investment decisions while still providing a comprehensive valuation process.

Understanding the investment process and cultural distinctions between public and private sector is critical for stakeholders, sponsor organizations, and management to make prudent decisions based on investment type.

3 Valuation

Both the public and private sectors devote extensive resources to the development, analysis, and interpretation of business cases for capital investments. The participants in this process come from multiple functional disciplines including financial analysts, lawyers, engineers, developers, project managers, accountants, and a variety of technical experts.

These capital investments are the foundation for new business, business development prospects, organic growth, market share, infrastructure development, and the continued sustainment of operations. In the Federal Aviation Administration (FAA), capital investments are used to replace the

aging National Airspace (NAS) infrastructure, provide new efficiencies in the control of air traffic, improve data communications and analyses, develop a more efficient flow of traffic for airlines (earlier departures, fewer delays and cancellations, increased number of operations), and provide a more seamless experience for the flying public with fewer delays and shorter wait times. Without this infusion of capital, the public sector would have to maintain current aging systems and make only slow incremental improvements.

In the private sector, capital investments provide opportunity for growth, new business ventures, and increased market share. Companies research new investment opportunities, develop those opportunities for implementation, and evaluate those opportunities to determine which ones provide the greatest return, the best strategic fit, and the quickest payoff. Without the luxury of a government funding allocation, the private sector values capital investments in terms of free cash flow. Companies evaluate investments using standard discounted cash flow (DCF) valuation metrics including Net Present Value (NPV), Internal Rate of Return (IRR), and Payback. Each metric provides a different perspective on the investment return, from pure discounted cash flow value (NPV), a rate of return that can be compared to the company's hurdle rate (IRR), or the number of years before the business case pays back the investment (Payback).

The public sector has adopted these same financial metrics to evaluate capital investments, but there are major business case valuation distinctions between the two sectors, especially in consideration for taxes, cost of capital, discount rates, DCF methodology, and stakeholders.

3.1 Discount Rates & Cost of Capital

In the classroom, professors teach the first major concept of Finance, the time value of money, where one dollar today is said to be more than one dollar tomorrow or one year from now. The concept is simple. Assuming our country or the world is experiencing inflation, the same dollar you have today will have less purchasing power by the end of the year. A hamburger at your neighborhood bistro will cost more next year than it does today.

Accordingly, when a company forecasts future cash flows, the financial analyst (or economist) forecasts an increase in cost for the same goods or services each subsequent year. Inflation is applied to "real dollars" to be defined as "nominal dollars," and to get the *present value*, or today's value, of the goods or services, these costs are discounted by the company's or the project's cost of capital. What is the cost of capital? It is the opportunity cost of the company for investing the same funds (for this capital investment) in something else. This essentially is the cost for the company or agency to raise capital to invest in a project.

3.1.1 Private and Public Sector Discount Rates

For major corporations with both debt and equity, the cost of capital is a combination of the cost to raise money or invest in equity and debt with the current mix of assets. In Finance, this is also referred to as the Weighted Average Cost of Capital (WACC):

Formula 1: The Weighted Average Cost of Capital

$$WACC = \frac{E}{(D+E)}(r_{eL}) + \frac{D}{(D+E)}(1-t)(r_D)$$

The WACC is based on the company's cost of raising debt capital (D), the cost of the company to raise equity capital (E), and the corporate mix between these two capital sources, (D/V) and (E/V), respectively. In Formula 1 above, D = the market value of debt, E = the market value of equity, r_d = the discount rate for debt (the average interest rate on long-term debt), r_{el} = the discount rate for (levered) equity calculated using the Capital Asset Pricing Method (CAPM), and t = the tax rate.

For most major corporations, the WACC is used as discount rate for nominal dollar cash flows (see Section 3.3) to calculate the present value of a project's cash flows. When a corporate analyst calculates Net Present Value (NPV), this defines the project's incremental value to the company. When companies calculate a project's Internal Rate of Return (IRR), this rate is compared to the company's WACC. In this case, the WACC is the company's hurdle rate. For example, if a project's IRR is 15%, and the companies hurdle rate is 12%, the project is assumed to have value (15%>12% = incremental value). There are other considerations for the project, including a limited capital budget, mutually exclusive project investments, strategic impact, and portfolio fit, but from a pure Finance point of view an IRR greater than the hurdle rate is interpreted as a good investment.

Since private sector investments are measured or discounted by the company's WACC, the investment decision is measured in part by the company's debt, its ability to raise equity capital and debt capital, its liquidity, and cash flow. Companies who have difficulty raising capital or who have a low debt rating may have a higher cost of capital and, hence, a higher hurdle rate for capital investments. In this way, in the private sector, capital investment NPV is determined not only by the intrinsic value of the investment opportunity, but also by the company's ability to finance the investment.

Most large public companies discount their capital investments by their company cost of capital, but they can alternatively finance a capital investment with a group of equity investors (sponsors) and a group of lending institutions based upon the project's forecasted cash flows. This is referred to as "project finance," and it alleviates the financing burden from the sponsor company. A project-financed investment will have a separate cost of capital other than the sponsoring company's cost of capital.

The public sector's cost of capital is essentially the Treasury Bill rate or the government's yield on short-term debt. This is the government's cost to do business. It can either (1) issue debt or (2) make a capital investment or government acquisition. Typically, and for most of the last 30 years, the Treasury Bill rate has been very low, and, correspondingly, the government's cost of capital is very low. This means that the public sector's cost of capital is almost always lower than the private sector, and it can invest in lower-yield projects. The way that the public sector calculates value or "benefits" is different than the private sector as well (see Section 3.4.1). The government considers capital investment value to many different stakeholders as project benefits, unlike the private sector, which measures benefits in terms of free cash flow to the company.

The primary difference between the public and private sectors' cost of capital is that companies, depending on their risk, financing mix, and debt rating will have a widely varying cost of capital, which will impact their ability to finance projects. The government, on the other hand, has the bare minimum hurdle rate for investments; its cost of capital is often referred to as the "risk-free rate." As company, investor, financial analyst, or cost estimator, it is important to understand the differences between public and private sector cost of capital and the factors that may impact a project's hurdle rate, value, and opportunity for success. While the cost of capital is just one of many factors that determine capital investment value, understanding the distinctions will further help decision makers identify the best

sponsoring organization for a specific investment – corporate financed, project financed, or government funded.

3.1.2 Government Discount Rate Basis and Updates

The government, through the OMB, circular A-94, sets discount rates which agencies use to calculate the present value of capital investments and acquisitions and to compare investments on an equal basis. They set standards for discounting program costs and benefits, deploying the primary concept of Finance, the time value of money, where a dollar today is worth more than a dollar tomorrow. To capture both (1) the impact of inflation on costs and project value and (2) the cost of capital, the government sets standards by which it can discount program costs and benefits to stakeholders and society to a present value, so they can:

1) Compare value between mutually exclusive projects for which the government spends F&E capital,
2) Deterministically evaluate whether or not an investment adds value to an agency mission, economically solves a critical problem, and makes best use of taxpayer dollars.

The OMB sets discount rates against certain classifications, (1) the Discount Rates for Benefit-Cost Analyses (BCA) in Table 1, found in OMB Circular A-94 Appendix D, Revised December 28, 2023 and (2) the Discount Rates for Cost Effectiveness, Lease-Purchase, and Related Analyses as defined in Table 2 below, which is found in OMB Circular A-94 Appendix C, Revised December 28, 2023.

Discount Rates for CBA
OMB direction is to use the 3.1% real discount rate for Benefit-Cost Analyses[1]. There is an exception in four cases: Cost-Effectiveness, Lease-Purchase, Internal Government Investment, and Asset Sales Analyses. In these cases use the rates below.

Table 1: Discount Rates for Benefit-Cost Analyses (2023, 2024)

2024

Discount Rates for Cost Effectiveness, Lease-Purchase and Related Analyses[2]

Nominal Interest Rates on Treasury Notes and Bonds of Specified Maturities (in percent)

3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
4.5	4.4	4.4	4.4	4.7	4.7

Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in percent)

3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
2.2	2.2	2.2	2.3	2.5	2.5

Table 2: Discount Rates for Cost Effectiveness, Lease-Purchase, and Related Analyses (2024)

Discount rates in Table 2 reflect the Benefit-Cost Analysis (BCA) rate at which investments should be discounted for value provided exclusively to the government (cost effectiveness to the government) as an equivalency of the government's own cost of capital, which is borrowing money via treasury bonds. These bonds are listed according to the investment time horizon.

In Table 1, discount rates represent a blended rate between the government cost of capital and that of private sector stakeholders who benefit from the government capital project. In this case, private sector stakeholders receive benefits from these projects and are fiscally invested. In the case of the FAA, airlines benefit from improvements to surveillance radar infrastructure or new software technology for air traffic controllers to increase communications with pilots and increase flight arrivals during arrival pushes, increasing airport capacity. Not only to the airlines benefit from increased revenue from these investments, but they also equip aircraft with the required equipment to enable these technologies, anticipating an economic ROI. In this case the airline cost of capital should be a consideration in the discount rate. Instead, the OMB suggests a single rate for all of these analyses, 3.1% as of the latest guidance.

This discount rate from the OMB is infrequently updated and remains static for years. The prior BCA real rate used was 7% and remained static for 31 years from 1992 until 2023. During this time, the private sector cost of capital changed based on inflation, monetary policy, cost of equity and debt, corporate leverage, and other capital market influences (Figure 1).

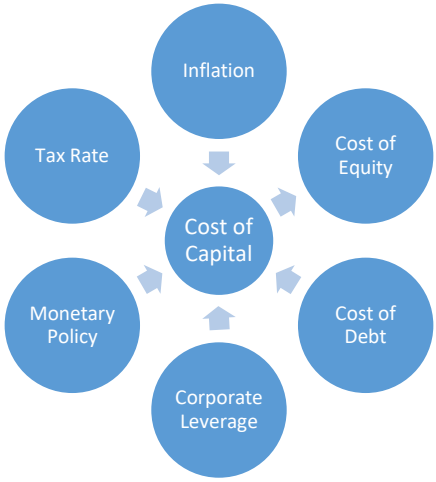

Figure 1: Private Sector Cost of Capital Influencing Factors

In 2014, the OMB set discount rates against the same classifications, (1) the Discount Rates for Benefit-Cost Analyses (BCA) in Table 3, found in OMB Circular A-94 Appendix D, Revised December 2012 and (2) the Discount Rates for Cost Effectiveness, Lease-Purchase, and Related Analyses as defined in Table 4 below, which is found in OMB Circular A-94 Appendix C, Revised December 2012.

Discount Rates for CBA

OMB direction is to use the **7%** real discount rate for Benefit-Cost Analyses. There is an exception in four cases: Cost-Effectiveness, Lease-Purchase, Internal Government Investment, and Asset Sales Analyses. In these cases use the rates below.

Table 3: Discount Rates for Benefit-Cost Analyses (1992 – 2023)

2014

Discount Rates for Cost Effectiveness, Lease-Purchase and Related Analyses[1]

Nominal Interest Rates on Treasury Notes and Bonds of Specified Maturities (in percent)

3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
1.0	1.9	2.5	3.0	3.6	3.9

Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in percent)

3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
-0.7	0	0.5	1.0	1.6	1.9

Table 4: Discount Rates for Cost Effectiveness, Lease-Purchase, and Related Analyses (2014)

As explored in Section 3.3, the government likes to set dollars in base-year (BY) or "real dollars." This makes it easier for government officials and analysts to recognize cost drivers and when costs change for reasons other than inflationary price escalation. However, using a real discount rate sometimes underestimates inflation's impact on the real cost of equity and debt. Inflation can increase corporate risk and investment risk by increasing the cost to service debt and squeezing corporate margins. These discount fluctuations are not captured consistently in government benefit-cost analyses (BCA).

3.2 Taxes

One of the major distinctions between public and private sector cost estimation and business case evaluation is the impact of taxes on capital investments. In the public sector, taxes have little to no impact, except where they are incurred by private sector customers or stakeholders. If a public sector investment requires the private sector to invest in equipment, the company purchasing that equipment to enjoy the benefit from the government investment will have to pay taxes on that equipment and depreciate the asset. Similarly, companies receiving incremental benefits from a government investment will pay taxes on the incremental revenue provided from this investment at their normal tax

rate. These tax implications must be considered by the private sector, but public sector awareness of these impacts will allow decision-makers in the government to increase the odds of stakeholder endorsement of government sponsored capital investments.

In the private sector, taxes not only impact project value (NPV, IRR), but they play a strategic role in capital investments in the form of depreciation tax shields, off-balance-sheet financing, and project finance. Just as the tax rates companies pay differ from country to country, effective tax rates applied to capital investments differ based on project location, financing structures, and accounting strategies. Some of these accounting strategies are explored in sections 3.1.1 and 3.1.2, and an understanding of these techniques and motivations assist both private and public sector managers in making better investment decisions.

3.2.1 Depreciation Tax Shields

In the public sector, taxes play a minimal role in investment decisions. For federal government capital investments, taxes are not applied, and, therefore, analysts and accountants do not have to explore ways to minimize the impact of taxes on these investments. Indirectly, government capital investments can include tax impacts. Private sector companies, which receive incremental revenue as a result of government investments, will have to pay taxes on that incremental revenue. Additionally, if a company is required to purchase hardware, equipment, or some other type of asset in order to realize the benefits of a government investment, those purchases will be taxed as well, and the incremental revenue to the company based on this investment will be impacted by the accounting depreciation rules applied.

For private sector capital investments, taxes play a more integral role on investment value, impacting project NPV and IRR. When the capital expenditure (CAPEX) that the company spends on the investment is treated as a depreciable asset, a depreciation tax shield applies to the investment and impacts project free cash flow (FCF). Depreciation is a method of allocating the cost of a long-term asset over its useful life, and it assumes that the asset value will decrease over time, during its use. How fast that asset depreciates or how quickly the company can depreciate the asset depends on the asset type, the definition of its useful life, and other accounting rules.

In a simple example of depreciation, an asset costing $100,000, depreciated over 10 years would incur an annual depreciation value of $10,000. At the end of the first year, the remaining book value, asset value remaining on the balance sheet, would be $90,000.

Other than generating an expense, CAPEX depreciation derives value from reducing the program's taxable income. When a company depreciates asset value of a capital investment, the depreciation reduces the tax basis upon which the project is taxed.

After calculating revenue and costs, the company calculates the depreciation impact on taxable income. In our previous example, if annual project revenues are $500,000, and costs are $200,000, assuming the 10-year straight-line depreciation of the $100,000 in CAPEX, the taxable income is reduced from $300,000 in the first year to $290,000. The analyst then calculates taxes on the $290,000 instead of $300,000. Assuming a 35% tax rate, due to the project depreciation applied, the investment is "shielded" from $3,500 in taxes ($10,000 X 0.35). This is the project's **depreciation tax shield**.

The depreciation tax shield is defined as the amount by which income tax payments are reduced by deducting depreciation from taxable income. Accountants can influence capital investment value and free cash flow by the depreciation basis they use for the specific investment or asset.

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Revenue			500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Variable Cost			(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)
Fixed Cost			(50,000)	(50,000)	(50,000)	(50,000)	(50,000)	(50,000)	(50,000)	(50,000)	(50,000)	(50,000)
Operating Gain			300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Depreciation Percentage			10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Depreciation (Straight-Line, 10-yr)			(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)
Taxable Income			290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
Cash Income Taxes (35%)			(101,500)	(101,500)	(101,500)	(101,500)	(101,500)	(101,500)	(101,500)	(101,500)	(101,500)	(101,500)
Change in Working Capital			(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
Cash from Operations (CFO)			197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500
CAPEX ($100,000 over 2 yrs)	(50,000)	(50,000)										
Net Cash Flow (NCF)	(50,000)	(50,000)	197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500	197,500

Figure 2: Depreciation Tax Shield Impact on Net Cash Flow using Straight Line Depreciation*

*Example in Real Dollars (Excludes inflationary impacts)

In Figure 2, the depreciation reduces annual taxable income by $10,000 and shields the capital investment from $3,500 in taxes each year, increasing the value of the business case.

3.3 Nominal Versus Real Values for Discounting

3.3.1 Private Sector DCF – Nominal Rate Discounting

When developing a Discounted Cash Flow (DCF) valuation model for capital investments in the private sector, companies apply cost-specific inflationary rates across all variables. For labor, the analyst may apply market inflation. For software development, the financial analyst may apply an additional factor depending on market demand for those services. For energy companies, whose revenue is dependent upon a forecast of commodity prices, the companies will apply a proprietary commodity price forecast, which may significantly exceed or trail the standard inflation index.

When variables are quantified in current year dollars, they are referred to as "Real Dollars." In this case, variable costs are held constant over a time series. If the cost of an oil rig drilling bit were $50,000 in 2016, applying the real rate means that the same bit would be $50,000 in 2017, 2018, etc. until the end of the business case. The public sector refers to this rate as "base-year dollars" (BY$). When inflation is applied to these variables, where the real rate is escalated each year by the variable rate of inflation, it is classified as "Nominal Dollars," in which case each subsequent year is higher in value than the previous year. The public sector refers to this as "then-year dollars" (TY$) because, when calculated with a nominal escalation rate, the cost of the variable for each year represents the true cost in that year.

In private sector DCF models, once cash flows are estimated in nominal dollars, the time series is discounted by the company's or project's Weighted Average Cost of Capital (WACC) [see section 3.2] in order to be expressed in Present Value (PV).

This method of discounting nominal cash flows by the cost of capital is standard convention for DCF models in industry, and it takes into account distinct inflationary escalation rates for multiple variables

before discounting. Assuming these forecasted escalation rates hold true within one or two standard deviations, nominal rates provide the most accurate assessment of future project costs.

3.3.2 Public Sector – Real Rate Discounting – Economics Using Real Dollars (discounting BY$) and Budgeting in Nominal Dollars (Forecasting cost in TY$)

In order to simplify cost estimates during investment analysis for major capital investments in the public sector, government agencies discount "base-year dollars" or real dollars by the risk-free rate without inflation. Without inflation, the current government discount rate is trivial. The current federal government guidance for discount rates in the next several years is less than 2% or 7%, depending on whether or not the public sector investment includes private sector benefits.

What is the public sector's motivation to discount real dollars and to exclude inflation? Expressing economic model variables in terms of "real dollars" allows the cost analyst to show constant dollars across the time series, i.e. $1,000 in 2016, $1,000 in 2017, $1,000 in 2018, etc., which is easy to audit and transparent for agency executives reviewing the business case. However, eliminating the inflation-component from the multiple cost variables erases the impact of different rates of inflation on different model variables.

As stated above, commodities likely escalate at a different rate than government labor, and software development costs escalate at a different rate of inflation than hardware. By discounting cost variables in base-year dollars, the multiple-factor inflation rates are not calculated. Essentially, the public sector trades off inflationary accuracy for simplicity and transparency.

The consequence of this public sector discounting convention is the potential for large government acquisitions to understate the impact of variable risk in independent cost estimates and for decision-makers to misinterpret program value. Fortunately, the public sector applies "then-year dollars" to budget forecasts, incorporating a standard labor rate escalation factor and escalating all other variables by inflation.

Analysts evaluating public sector acquisitions should keep in mind the drawbacks of real rate discounting. By discounting only in BY$, multiple-factor inflation is not applied, escalation assumptions are oversimplified, nominal commodity prices are not captured, and discount rates are applied risk-free. Even if the government's cost of capital is essentially the risk-free rate, ignoring the impact of inflation for economic analysis exposes the government to program risk, a potential misinterpretation of program value, and potential cost overruns.

The government is unique in its use of BY$ (real) discounting. It is actually less accurate to exclude inflation and discount cash flows by a discount rate which also excludes inflation. If different cost elements escalate at different rates of inflation, BY$ treats them all equally. That could understate costs or revenue.

In order to mitigate the potential value interpretation risk from base year discounting, financial analysts developing independent cost estimates for government capital investments could discount costs and benefits in both real dollar values and nominal dollar values and compare the results. In some cases, this exercise will reveal escalation sensitivities of certain cost variables that could drive investment value.

3.4 Discount Cash Flow (DCF) Valuation

3.4.1 Cash Flow Versus Benefits to All

How the public and private sectors calculate value is dependent on how they define value within the organization and in their valuation models.

Private sector companies measure value as incremental cash flow to the company with special consideration for how that cash flow impacts net income and shareholder value. They consider tax implications on cash flow, annual capital funding budgets, retained earnings, budgets for research and development, corporate leverage, and debt funding capacity. Where continued cash flow drives shareholder value, market share, and funding obligations, capital investments are a critical component of corporate value and company growth. A company's continued existence hinges on its ability to identify and capitalize on new growth opportunities, to adapt to changing market conditions, and to evaluate and make prudent investment decisions.

In the public sector, the taxpayers fund and elected officials control government spending, and associated capital investment funding must be spent with those interests in mind. Public sector investments have a specific role in society and for the agencies they maintain. Unlike the private sector, the government is not concerned about profit, except where fees and taxes are used to subsidize future investments. Capital investments are not measured in cash flow; instead, they are measured according to cost to the agency and benefits to the public, for efficiencies in the private sector, and to sustain government infrastructure.

Where capital investments lack profitability, competitive advantage, or payoff, the government makes investments which would go unmet in the private sector. Instead of concerns about shareholder value or debt repayment, the government is concerned about filling a need to society and meeting the needs and interests of the public.

Financial evaluation of capital investments in the public sector are, therefore, complicated when consideration must be made for strategic or political reasons. As a result, it is not uncommon for the public sector to fund investments with little or no investment value. To complicate matters more in the federal government, capital planning can change dramatically year-to-year depending upon funding allocations from Congress. Even more than their private sector counterparts, government agencies must employ flexible capital budgets and develop project contingency plans in anticipation of changes to funding allocations.

As illustrated by Figure 4, distinctions between the public and private sectors value are clear, and managers' understanding of those value drivers and interests are critical to make the right investment decisions.

	Value Drivers	
Benefits	**Public Sector** Public Needs and Interests Public Infrastructure Political interests Private Sector Efficiencies Government Strategic Interests	**Private Sector** Corporate Cash Flow Tax Shields Competitive Advantages Market Share
Costs	**Public Sector** Acquisition Costs Operations Budget funding allocations Risk-free rate (t-bills)	**Private Sector** Cost of Capital Taxes Dividends Funding debt

Figure 3: Public and Private Sector Value Drivers

3.4.2 Valuation Metrics (NPV versus IRR, B/C versus NPV)

When the public and private sectors consider capital investment decisions, the type of valuation metric and the exclusive reliance on one specific metric can have unintended consequences. Understanding how each of these valuation metrics work for companies investing in capital improvements, new investment opportunities, or for government agencies investing billions of dollars in major acquisitions will help executives and committees make better investment decisions and make the most use of limited capital.

3.4.2.1 Net Present Value (NPV) versus Internal Rate of Return (IRR)

In the private sector, Net Present Value (NPV) and the Internal Rate of Return (IRR) are the two most popular metrics used to value capital investments. Both metrics are effective measurements used to decide whether or not to invest in the project. However, since each has its strengths and weaknesses, Finance managers usually consider both metrics when evaluating investments.

NPV is calculated by discounting the capital expenditures (CAPEX) and annual cash flows by the cost of capital. In Formula 2 below, C_0 is the initial capital outlay, and C_1, C_2, C_3, etc. are annual cash flows, discounted by the cost of capital, r, the opportunity cost of the company to raise funds for the investment. In the formula, T is the final year cash flow.

Formula 2: Net Present Value

$$NPV = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \cdots + \frac{C_T}{(1+r)^T}$$

NPV measures a capital investment in dollars as having value if the NPV is greater than zero. Using NPV, the larger the total dollar amount, the larger the value proposition. Where companies have a limited budget for capital investments, the initial investment cost or cash outlay is critical in evaluating the investment. Constrained capital budgets are common in both the government and in the private sector. Many companies and government agencies consider NPV as a critical measure in evaluating capital

investment projects. However, IRR is even more commonly used, and when it is considered exclusively to evaluate projects, managers might misinterpret relative value.

The Internal Rate of Return (IRR), the discounted cash flow (DCF) rate of return, is calculated as the discount rate that makes NPV equal zero. The equation is similar to NPV, but the IRR becomes the discount rate in the denominator of each cash flow.

Formula 3: Internal Rate of Return

$$NPV = C_0 + \frac{C_1}{(1+IRR)} + \frac{C_2}{(1+IRR)^2} + \frac{C_3}{(1+IRR)^3} + \cdots + \frac{C_T}{(1+IRR)^T} = 0$$

The IRR can be just as effective a measure in evaluating capital investments as NPV, and it is easier for non-financial managers to understand as it is expressed as a percentage return, i.e., 33% IRR. However, without proper considerations, IRR used exclusively can be misleading.

According to Brealey and Myers in *Principles of Corporate Finance*[1], IRR as a measure of value has four major pitfalls including the following:

1) **Lending versus Borrowing** – Considering whether or not cash flows indicate the project is lending or borrowing money, value would be interpreted differently, where the investor wants to borrow at the lowest rate of return and lend at the highest rate of return. If different cash flows represent lending and borrowing, IRR can mean opposite things, investment value as high or investment value as low.

2) **Multiple Rates of Return** – If cash flows alternate, more than once, i.e., negative cash outlay, followed by positive annual cash flows, then more than one IRR can be calculated. Depending on where IRR is calculated, there would be more than one rate where NPV = 0.

3) **Mutually Exclusive Projects** – If a company or government agency has to choose between alternative ways to do a project, those alternatives are mutually exclusive. In other words, you choose one option or the other, not both. When comparing between mutually exclusive investments, sometimes where two projects have favorable IRRs (higher than the company cost of capital), the project with the higher IRR might have the lower NPV. If the company or agency chooses the higher IRR in the case of a lower NPV, it could be giving up value and choosing the wrong investment alternative.

4) **Term Structure of Interest Rates** – In situations where a company or project has several opportunity costs, the Finance manager has "to compute a complex weighted average" of IRRs to have an accurate relative measure.

Both private sector companies and federal agencies use IRR as a measure of value for capital investments, and sometimes to interpret investment values to senior management or to non-financial managers, IRR is used exclusively to interpret value. As demonstrated in the list above from *Brealey and*

[1] Principles of Corporate Finance, Brealey and Myers, 4th Edition, McGraw-Hill Higher Education

Myers, IRR used exclusively to interpret investment value can be misleading and might result in the wrong investment decision.

The easiest solution to this value proposition dilemma is to measure IRR alongside NPV and to provide greater investment decision weight to NPV.

3.4.2.2 B/C Ration versus NPV

In order to simplify investment analysis metrics for decision-makers in the public sector, the government derived an intuitive acquisition metric that can be applied across capital investment programs in order to compare relative value. Since the government is more interested in return on investment, and since that return is (1) void of tax implications and (2) not measured in terms of cash flow, the metric on which the public sector most relies is the B/C Ratio.

Formula 4: B/C Ratio

$$\frac{B}{C}\ Ratio = \frac{PV(BY\$\ Benefits)}{PV(BY\$\ Costs)}$$

Like the Internal Rate of Return (IRR), which measures relative value, in this case the project percentage return when Net Present Value (NPV) equals zero, the B/C Ratio determines relative program return by comparing benefits and costs directly. To calculate the B/C ratio, the analyst divides the present value of *real* or *base-year* benefits by the present value of *base-year* costs. Any B/C value greater than one is considered a good investment. Any project B/C value less than one cannot justify program costs by its return.

Just like IRR, the B/C ratio has its drawbacks. Sometimes when government budgets are tight, capital investment budgets are frozen at prior year levels or constrained where the agency must choose to fund some programs over others. Program managers recalculate the impact of a funding delay or the capital constraint on their investments, and often these impacts are measured in terms of the B/C ratio.

When considering mutually exclusive capital investments, where a government agency is unable to fund all of the investments in its portfolio and must choose between them, using the B/C ratio as an exclusive measure of value might result in a misinterpretation and a less valuable allocation of capital dollars. In Figure 4 below, the example demonstrates how a public sector investment committee might choose to allocate a constrained capital budget between mutually exclusive projects to a less valuable investment if the B/C is the only Finance metric considered in the investment decision.

Figure 4: Mutually Exclusive Investment Decisions using B/C and NPV

	PV (Cost)	PV (Benefits)	B/C	NPV
Project A	11,000,000	18,000,000	1.6	7,000,000
Project B	20,000,000	30,000,000	1.5	10,000,000
Project C	25,000,000	36,000,000	1.4	11,000,000

Table 5: Mutually Exclusive Investment Decisions using B/C and NPV

In Table 5, we assume that an agency has a choice between three capital investments with a maximum budget of $25M. With this constrained budget scenario, how would the B/C ratio influence an agency's investment decision?

In this example between mutually exclusive investment decisions, if the public sector investment committee uses the B/C Ratio exclusively to decide which project to fund, they would likely choose to invest in Project A. However, Project A has the lowest NPV. Choosing Project A would leave $14M of capital unutilized and would yield the least investment value between the three choices. If the investment committee compared the three investments using both the B/C ratio and NPV as investment criteria, they would realize that in this case, the project with the lowest B/C ratio yields the highest NPV and provides the largest capital return, or "benefit" in the case of the government, for the constrained capital budget.

With or without budget constraints, the public sector considers other factors besides economic value when evaluating investment decisions. For the government, a B/C ratio less than one does not automatically disqualify the economic investment. Instead, the program value must be justified by one of several other intangible, qualitative, or strategic factors including the following:

- **Strategic Fit**
  - Is the project the best fit for the organization's goals?
- **Infrastructure Modernization**
  - Is the investment required to modernize an aging infrastructure?
- **Portfolio Value**
  - Does the investment enable value in other investments within a portfolio of programs?
- **Obsolescence**
  - Is the investment replacing a current operational system that is difficult to replace or which is now obsolete?
- **Other Program Interdependencies**
  - Does the investment have interdependencies with other programs within a larger portfolio or with a common initiative?

For private sector investments, companies conducting DCF valuations for major capital investments can make better investment decisions when balancing the IRR valuation metric with NPV. An overreliance on one valuation metric can lead to unintended investment decisions.

For the public sector, while the B/C ratio is convenient and easy for non-financial managers to understand, using B/C exclusively to decide between investment decisions in times of constrained government budgets can result in underutilized capital budgets and unintentionally choosing a project with lower total benefits.

4 Government Discount Rate Changes and Valuation Risks

4.1 Market Industry Discount Rates – Aviation Example

As we explore the appropriate discount rate for government projects with private sector stakeholders, we examine a hypothetical example using an airline as a beneficiary of a new FAA technology.

4.1.1 Analysis of Discount Rates in Airlines

Consider the cost of capital of American Airlines. If the WACC of AAL is 7.7% as a nominal discount rate (valueinvesting.io/AAL/valuation/wacc, 2025, January 12), as a representative stakeholder in major FAA capital investments and potential recipient of "project benefits" used for calculations of project value, then the discount rate in real rate terms (without inflation) would be a major contributing factor for the discount rate used to calculate government project value.

American Airlines Group (AAL) Weighted Average Cost of Capital (WACC)	
WACC of AAL	7.77%
Cost of Equity of AAL	11.25%
Cost of Debt of AAL	8.65%

Table 6: AAL Cost of Capital

AAL WACC versus Other Airlines – High D/E Ratio

As a representative sample, American Airlines has a significant Debt/equity ratio, meaning that it is highly leveraged, and much more of its financing is in debt than equity. With a high percentage of financing in debt (leveraged company), compared to other airlines, a higher portion of the WACC is influenced by the lower rate associated with debt financing than the more costly equity. The AAL cost of equity is 11.25% versus 8.65% for the AAL cost of debt. A less leveraged company would potentially have an even higher weighted average cost of capital (discount rate) since the WACC would be more heavily influenced by a higher cost of equity.

Formula 5: The Debt-to-Equity Ratio

$$Debt\ to\ Equity\ Ratio = \left(\frac{D}{E}\right) = \frac{(\text{STDebt} + \text{LTDebt} + \text{Other Fixed Payments})}{Shareholder's\ Equity}$$

4.1.2 AAL WACC vs Other Airlines – Beta

Another indicator and factor of risk which influences company and project WACC is the beta value. This compares the company risk versus other companies in the market, indicating how risky it is to invest in the company. If the company has a high beta value, its discount rate would be higher since that asset would have a higher risk premium associated with anticipated returns. In other words, investors would require a higher return in the asset to offset the higher risk of owning the stock. The unlevered (debt ratio removed) beta of AAL is 0.18. That is comparable to Southwest Airlines (LUV) at 0.11 and United Airlines at 0.16. Alternatively, Delta Airlines Inc has an unlevered beta of 0.48 and a higher levered beta than American Airlines. A higher beta would increase the risk premium and the associated WACC for investments. If airlines as a whole have a higher beta on average than American Airlines, they would require an even higher discount rate for capital investments. If the combined government discount rate for capital investments inclusive of combined government and industry costs of capital is too low when considering the cost of capital of AAL, it would be even worse when considering a higher beta.

4.2 Discount Rates, Inflation, and the Cost of Capital

4.2.1 Historically Low Inflation and Capital Costs

Over the 20-year period from 2000 – 2020, inflation has been at some of its lowest levels in history (See Table 7). Combined with high economic output and historically low interest rates, based on 10 and 20-

year Treasury Bonds, hovering near the risk-free rate, capital to the federal government has been extraordinarily low.

Figure 4: Average Annual Inflation by Year 2000-2024 (Source macrotrends.net inflation-rate-cpi)

For this same 20-year period, capital costs were at historic lows with nominal 20-year Treasuries ranging from 2.0 to 3.6%. For major S&P 500 companies, the weighted average cost of capital (WACC), the discount rate companies use for capital projects, ranged from 6-9%, encouraging growth.

During periods of sustained inflation, capital costs increase. Government Treasury rates increase, and the government incurs a higher cost of capital for capital projects and acquisitions. In the private sector, as the risk-free rate (Treasuries) increases, higher risk corporate debt will require higher returns to investors, increasing the cost of debt. Debt risk increases financing costs for companies, sometimes jeopardizing their fiscal health and increasing the rate of default and the likelihood of bankruptcy. As the risk-free rate increases, the cost of equity climbs as company returns must exceed those of alternative risk-free investments.

Overall, inflation causes an increase in the cost of capital for government agencies and private sector companies. When the U.S. experienced significant and sudden inflation in 2021, the discount rates for capital projects in both the public and private sector increased accordingly. At the same time, the OMB Circular A-94 guidance reduced discount rates from capital projects by more than 50%.

4.2.2 Delayed Impact of Inflation on Discount Rates

Inflation's impact on discount rates is not instantaneous. During periods of inflation, treasury rates trail the direction of inflation as the Federal Reserve uses monetary policy to control inflation. During periods of inflation, the Fed increases the Federal Funds Rate, which in turn increases the rates of return on

Treasury Bonds, to slow growth and discourage capital investment. This will cool an overheated economy by increasing the cost of borrowing. In many cases, the Fed is reactionary to indicators of inflation, so as defined by Figure 5, from 2020 to 2023, there was divergence between the rate of inflation and Treasury rates. At first, as inflation increased rapidly from 2020 to 2022, the Federal reserve was slow to react, and discount rates remained low. As the Fed raised rates to control inflation, Treasury rates increased while inflation stabilized and eventually decreased in 2023. Now, as inflation has approached Federal Reserve target rates, and the economy is closer to equilibrium, Treasury rates actually exceed inflation.

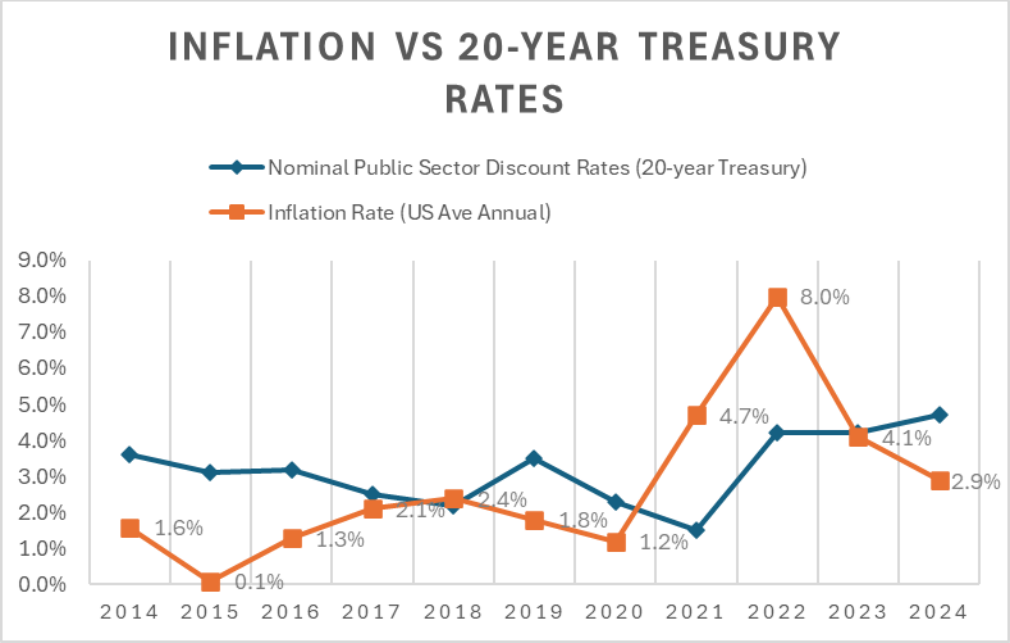

Figure 5: Inflation Rate vs 20-Year Treasury Rates
Source: https://www.usinflationcalculator.com/inflation/current-inflation-rates/ and OMB Circular A-94 Appendix C

4.3 Government Discount Rates Compared to Calculated Blended Rates

4.3.1 Discount Rates – Real and Nominal

Unfortunately, OMB guidance for economic analyses and benefit-cost analysis (BCA) advises cost estimators and government analysts to evaluate business cases using real or "base-year" dollars. Real discount rates exclude inflation, while nominal rates are inclusive of inflation.

In the private sector, companies evaluate capital projects using nominal discount rates and discount capital expenditures (CapEx) with the company's WACC (also in nominal rates). Since different cost and revenue streams include element-specific inflation, nominal discounting makes the most sense for discounted cash flow (DCF) valuation.

In the public sector, the government prefers using base-year or real discount rates, assuming more broadly that inflation impacts all costs and benefits in the same way. The OMB does provide two different rates as defined in Section 3 of this paper. For discount rate analysis, this paper focuses on the discount rate that is used to value capital investments that benefit both public and private sector stakeholders.

4.3.2 Government Combined Discount Rate for Capital Investments

When the government makes capital investments in projects that benefit only the government agency or agencies, the cost of capital used to value the cost and benefits of these projects is the cost the government requires to raise capital or the risk-free opportunity cost of that capital, captured by the interest rate on the 10-year or 20-year treasury bond. Treasuries are often referred to as the risk-free rate in the market as the federal government has next to zero risk of default. Unlike companies in the private sector, the government does not issue equity to raise capital, nor does it incur a tax burden for issuance of debt. Companies raise capital for projects by issuing a combination of debt and equity. Corporate bonds have a rate higher than the risk-free rate, measured by the company's risk of default. The cost of equity is a reflection of expected return and risk, which is reflected in its beta value.

For government capital investments that benefit both the government and private sector stakeholders, like airlines and airports in the case of the FAA, the government tries to estimate a discount rate that reflects both the cost of capital to the government and to private enterprises who are stakeholders in the investment. For this combined public/private cost of capital we presume that the mix of these rates is relatively evenly split, as government acquisitions often vary by how much they benefit the public and private sector. Assuming a relatively even split, the discount rate should represent an evenly distributed median between the government cost of capital and the WACC of corporate stakeholders. Without question, this rate will exceed the risk-free rate which is used as the discount rate in instances where benefits only go to the public sector.

4.3.3 Periods of Low Inflation and Low Cost of Capital – Impact on Discount Rates

From 2000 – 2020, the average of annual inflation was 2.1%, historically very low. Correspondingly, the cost of capital for companies to finance projects was relatively low as well. However, these costs of capital have risen significantly in recent years as inflation has accelerated. From the Harvard Business Review article, "Capital Is Expensive Again. Now What?", Michael Mankins notes, "For most of the last 15 years, capital has been cheap. Since 2009, the after-tax cost of borrowing for some large companies has been below the rate of inflation, making their debt in real terms cost-free. And for much of this time, the stock market moved steadily upward, consistent with historically low costs of equity. We estimate that in early 2022, the weighted-average cost of capital (WACC) for the average company in the S&P 500 hovered below 6%." For a comparison between inflation and corporate cost of capital, see Figure 6. The WACC remained relatively stable during the period from 2015 to 2019 and decreased in 2020 during the pandemic. However, inflation increased in 2021 and 2022, and then after a 2-year delay, the WACC of large companies also increased as capital became more expensive.

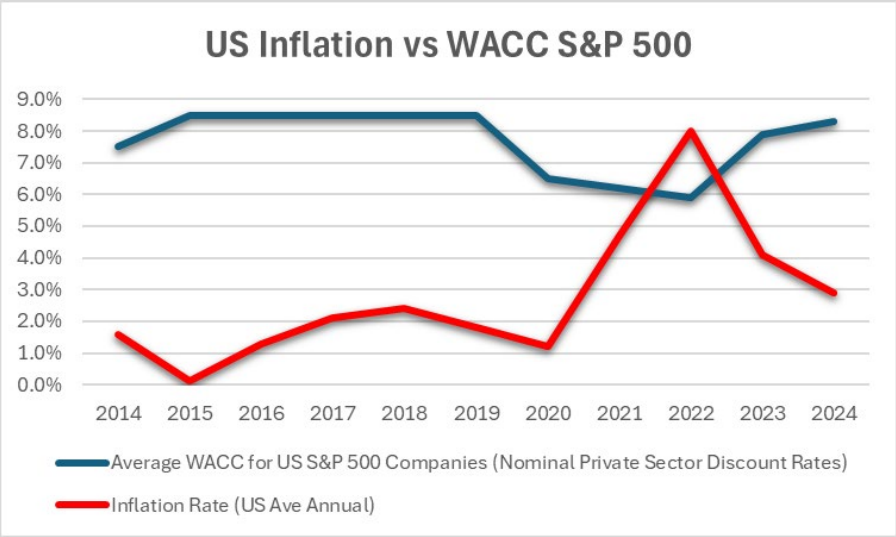

Figure 6: US Inflation Rate vs S&P 500 WACC

During this low inflation period of time (2000-2020), the combined rate of the public and private sector used to discount cash flow (or benefits and costs) for government investments, according to the OMB Circular A-94, was 7%, higher than private sector discount rates for most companies and much higher than the risk-free rate used by the public sector for discounting costs and benefits. As an example year during a low inflation period, we examined the cost of capital in 2016. To calculate the appropriate discount rate for government projects benefiting both public and private sectors, we combined a 7.2% real private sector WACC and a real 2016 20-year Treasury bond rate of 1.2% to get a calculated blended real discount rate of 4.2%, well below the 7.0% rate required by the OMB.

	Public Sector		Private Sector	
2016 Nominal Discount Rate	3.2%	20-yr Bond	8.5%	WACC
Inflation	1.3%		1.3%	
2016 Real Discount Rate	1.2%	20-yr Bond	7.2%	WACC
2016 Real Calculated Blended Cost of Capital	**4.2%**			
2016 Real Blended Cost of Capital from OMB Guidance	**7.0%**			

Table 7: Blended Public/Private Discount Rates Calculated in Period of Low Inflation and Low Capital Costs

Conclusion (Low Inflation, Low Cost of Capital) – During low inflationary periods, the US large corporation WACC and the rate of return US Treasury Notes and Bonds are relatively low. If the discount rate for large government capital projects which benefit both the public and private sectors is a combination of corporate WACC and US Treasury Bond rates, this rate should be low during the corresponding period. However, the OMB applied a 7% real discount rate during this period, much higher than the calculated combined rates.

Impact on Costs – During low inflationary periods, the cost of capital and corresponding discount rate for capital investments should be lower. From 2000-2020, when inflation and capital costs were low, the OMB discount rate was 7.0%, higher than the actual cost of capital. In Table 8, the calculated blended public/private discount rate is much lower than the OMB rate. During this period of time, for business cases with high costs, especially in out years, the present value of the capital project should have been

lower than was measured using OMB rates. Costs were discounted at too high a rate, and the present value of costs should have been higher than was measured. Perhaps some projects with larger out-year costs had an overvalued NPV.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Average WACC for US S&P 500 Companies (Nominal Private Sector Discount Rates)	7.5%	8.5%	8.5%	8.5%	8.5%	8.5%	6.5%	6.2%	5.9%	7.9%	8.3%
Nominal Public Sector Discount Rates (20-year Treasury)	3.6%	3.1%	3.2%	2.5%	2.2%	3.5%	2.3%	1.5%	4.2%	4.2%	4.7%
Inflation Rate (US Ave Annual)	**1.6%**	**0.1%**	**1.3%**	**2.1%**	**2.4%**	**1.8%**	**1.2%**	**4.7%**	**8.0%**	**4.1%**	**2.9%**
Real Private Sector Discount Rates	5.9%	8.4%	7.2%	6.4%	6.1%	6.7%	5.3%	1.5%	-2.1%	3.8%	5.4%
Real Public Sector Discount Rates (20-year Treasury)	1.6%	1.2%	1.2%	0.5%	0.2%	1.5%	0.3%	-0.5%	2.0%	2.0%	2.5%
Blended Real Public/Private Sector Discount Rate (Calculated)	3.8%	4.8%	4.2%	3.5%	3.2%	4.1%	2.8%	0.5%	-0.1%	2.9%	4.0%
Discount Rate OMB Guidance	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	3.1%

Table 8: Real Calculated Discount Rates vs OMB Guidance Discount Rates

Impact on Benefits – Project benefits during this 2000-2020 period were likely undervalued using the OMB discount rate of 7.0%. Benefits are incurred more prominently in out years after a project or system is deployed and can generate user benefits. With a discount rate that is too high, these benefits are undervalued, and the overall project NPV could have been understated.

4.3.4 Periods of High Inflation and Higher Cost of Capital – Impact on Discount Rates

During periods of inflation, the nominal cost of capital should increase significantly. Correspondingly, the corporate cost of debt and cost of equity, the primary components of WACC, should increase as well; investors in corporate debt and equity will expect a higher return if the opportunity cost of their capital is higher and if they could alternatively earn a significant return at the risk-free rate.

Mankins explains, “All that changed in March 2022, when the world’s central banks began raising rates to curb rising inflation. Over the next 12 months, the U.S. Federal Reserve increased its benchmark Fed Funds rate from 0.25% to 4.75%, and the yield on 10-year treasury notes climbed from 1.7% to almost 4% today (article from 3/2023). And, finally, the cost of equity capital also rose for the most large companies over this period – from less than 7% to approximately 10%, according to research conducted by Aswath Damodaran at the Stern School of Business at NYU. All in, the WACC increased by 50% or more in just 12 months – from less than 6% a year ago to nearly 9% today.” (HBS, March 30, 2023) In Figure 7, S&P WACC rises again in 2023 and 2024 as a result of higher Federal Reserve interest rates, the Fed’s monetary policy reaction to control higher inflation, which began in 2021.

Considering these major increases in inflation, corporate WACC, the cost of corporate debt, and the increase in the cost of equity capital, one would expect the OMB discount rate that reflects the blended cost of capital between the public and private sector to increase in both nominal and real rates. However, in the most recent OMB Circular A-94 from 2024, which is updated every three years, guidance requires a real discount rate of 3.1%, a reduction of 56% at the same time that the corporate WACC increased by 43%. Figure 7 depicts the change in discount rate guidance to the new 3.1% rate, while the calculated blended public/private sector cost of capital is now 4.0%.

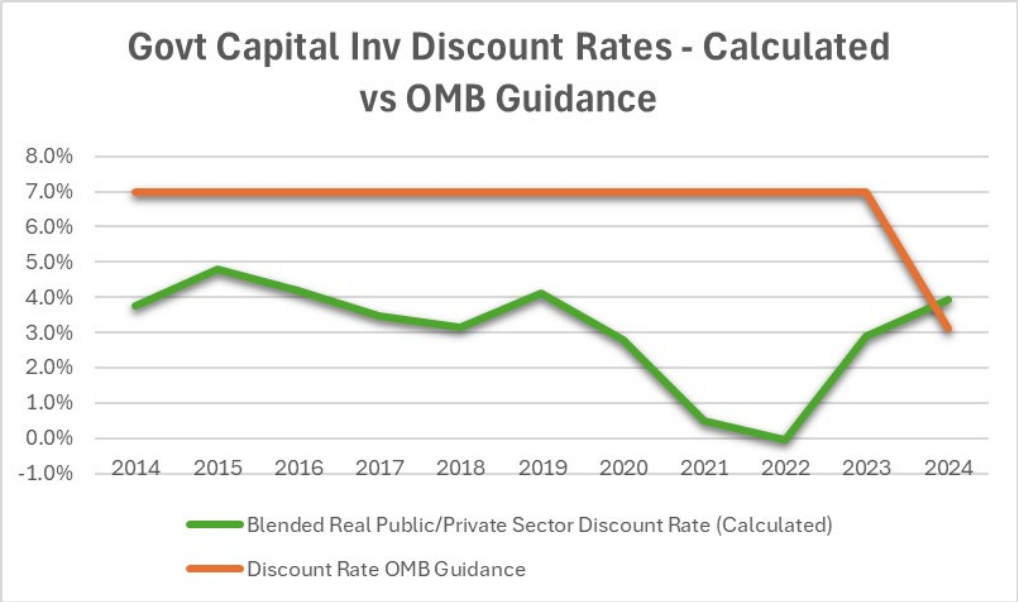

Figure 7: Calculated Public/Private Sector Discount Rates vs Government Capital Inv Discount Rate

In the 2024 publication of OMB Circulars A-4 and A-94, the OMB appears to have reverted to a discount rate that more closely tracks the real risk-free rate of Treasury bonds, rather than a blended public/private discount rate that reflects the risk and cost of capital associated with private sector stakeholders. In the MIT paper, "Comments on Draft Revisions to OMB Circulars A-4 and A-94," Joskow, Knittel, Lucas, Metcalf, Parsons, Pindyck, and Schmalensee write, "Whereas it can be appropriate to discount future cash flows at Treasury rates when the associated risk is uncorrelated with future aggregate economic outcomes, when the risk is correlated, some sort of risk-adjustment is necessary. We recommend using risk-adjusted discount rates, which can be identified using well-established fair value standards." (CEEPR, p3).

In the associated footnote 3, they mention, "When done correctly, the resulting valuation will be the same as if risk-adjusted discount rates had been directly applied to projected costs and benefits." (CEEPR, p3). If these projects have both government and corporate investors and beneficiaries of project value, the risk-adjusted blended public/private sector cost of capital should apply.

At a discount rate of 3.1%, OMB provides no consideration for a corporate cost of capital. The MIT paper continues, "discounting the average of those costs at a Treasury rate would neglect the effect of their value of the aggregate or systematic risk involved. The private sector would instead discount the expected future costs at a rate that includes a risk premium." (CEEPR, p4). Finally, the MIT paper reinforces a more regularly risk-adjusted blended discount rate be applied to government capital investments, claiming, "The logic behind approximating the government's cost of capital with that of the private sector, rather than equating it to Treasury rates, rests on several observations," including that systematic risks of investments are similar whether or not "undertaken by the private or public sector." In the final point, they state, "…like the public sector, the government cannot eliminate systematic risk through diversification." (CEEPR, p5).

Conclusion – The OMB's new government capital investment discount rate guidance is no longer a proxy for project risk associated with both a public and private sector cost of capital. The aftereffects of a

recent spike in inflation and interest rates further exacerbates the extraordinarily low discount rate. Government investments evaluated in 2025 and the foreseeable future will underestimate the PV of project costs and overestimate project benefits.

	Public Sector		Private Sector	
2024 Nominal Discount Rate	4.7%	20-yr Bond	8.3%	WACC
Inflation (Average Annual)	2.9%		2.9%	
2024 Real Discount Rate	2.5%	20-yr Bond	5.4%	WACC
2024 Real Calculated Blended Cost of Capital	**4.0%**			
2024 Real Blended Cost of Capital from OMB Guidance	**3.1%**			

Table 9: Blended Public/Private Discount Rates Calculated in Period of High Inflation and Higher Capital Costs

In a combined rate example equally weighting both the risk-free rate of a 20-year treasury bond and the average corporate WACC of large companies, using a simple average we would get the following:

- The 2024 risk-free rate is 2.5% according to the OMB table. This is the discount rate used by the government for investments which only benefit the government.
- The 2023 WACC for large companies in nominal terms is approximately 8.3%. Reducing this rate by 2.9% 2024 inflation to convert to real rates, we get a 5.4% real rate.
- The median between 2.5% and 5.4% is 4.0%, which should represent the blended real discount rate, agencies should use to discount costs and benefits and estimate net present value (NPV).

Using this 4.0% 2024 calculated value for a real discount rate, the OMB recommended rate of 3.1% is 23% lower than the 2024 calculated blended rate.

Conclusion (High Inflation, Higher Cost of Capital) – During high inflationary periods, the US large corporation WACC and the rate of return US Treasury Notes and Bonds will increase, usually in a slightly delayed correlation with inflation rates as the Fed raises rates to control inflation. After a few years of high inflation, Treasury rates and corporate WACCs are higher than previous discount rates over the last 10 years. With new guidance for 2024 and 2025, the OMB lowered the real discount rate to 3.1% from 7%. This underestimates current public and private sector capital costs and is 23% lower than it should be.

Impact on Costs – During high inflationary periods, the cost of capital and corresponding discount rate for capital investments should be higher. Table 9 shows that the calculated blended public/private discount rate is now higher than the OMB rate. Over the last 20 previous years, the OMB rate was too high, and now during this inflationary period, the rate is too low. For new business cases with high costs, especially in out years, the net present value of the capital project will be understated.

Impact on Benefits – Project benefits in 2024 and 2025 using the new OMB discount rate of 3.1% will be overvalued, especially benefits which naturally occur in out years after a project or system is deployed. With a discount rate that is too low, benefits are overvalued, and the resulting NPV might present a positive NPV when it otherwise might not.

5 Other Valuation Risks

When evaluating major capital investments, both the public and private sectors pay special attention to risk. Not only are companies and agencies concerned about the project management risks associated

with implementation, but when conducting investment analysis, risks to cost, benefits, and cash flow take precedence. Management champions any valuation method that allows them to minimize or mitigate these risks, and both the public and private sectors continue to develop processes to ensure accuracy and to minimize surprises.

When evaluating cost and benefits estimates in business cases, the public sector applies risk range conditions when calculating valuation metrics. Instead of a point estimate or Monte Carlo Simulation risk-adjusted estimate for costs and benefits, the government applies the most conservative Monte Carlo risk ranges, the 80th percentile of costs and the 20th percentile of benefits. By applying these conservative values, assuming that the business case has a sound basis of estimate, the government assures a high probability of not exceeding the 80th percentile cost estimate and a low probability of achieving fewer benefits than what was quantified at the 20th percentile.

This is a risk-adjustment approach developed to reassure government acquisition officials that the business case will deliver the value that it proposes. It essentially takes a pessimistic view of base case valuation and lowers performance expectations, monetizing the rare event where a business case realizes higher costs as well as lower benefits. Despite this approach, public sector business cases still breach baselines and have cost overruns, but this is partly attributable to the complexity of public sector business cases and the proprietary requirements of major federal government acquisitions.

For public sector acquisitions, program managers navigate a large and sometimes tedious investment analysis process necessary to identify and manage investment risks and to maintain budget baselines. The private sector does not institute such an extensive investment analysis process when evaluating capital investments. While each business case is provided a thorough litmus test and valuation, investment decisions are usually proposed in a flatter organization structure where decision-makers closely follow business development proposals. New business case proposals are more often compared to a portfolio or peer group of business cases and evaluated against pre-defined hurdle rates. In that way, the private sector is more likely to select the highest return investments without further obligation.

Both the public and private sectors evaluate business case risk, but they account for these risks in different ways. While private sector business case analysis is often more flexible and streamlined, the public sector applies conservative value conventions that reduce the probability of a program coming in over-cost and with less intrinsic value.

6 Conclusion

In companies and government agencies alike, rules and processes are put into place to facilitate an understanding, add transparency, and interpret risks of major capital investments. Unfortunately, there is no single rule or process that can prevent financial pitfalls or eliminate risk in valuing investments. For the financial analyst, having an awareness of the public and private sector valuation methods, sources of value, cultural influences, stakeholders, and discount rates can help managers make better investment decisions and understand the consequences of the decisions that they make.

While IRR is easy for nonfinancial managers to understand and can be used to compare the relative return of investments of any size or complexity, in cases when capital is constrained and companies must choose between mutually exclusive investments, IRR can be misleading without adding other metrics for context. Since the government investment hurdle rate is minimal and program benefits all-

encompassing, the B/C Ratio is the metric of choice for some government agencies in evaluating acquisitions. Without the addition of NPV, evaluations using the B/C ratio exclusively may lead to the wrong conclusions and investment choices.

In the private sector, taxes, cost of capital, inflation, and discount rates all play a large role in calculating investment value, while in the federal government these factors are standardized and serve a much more limited role in investment analysis. Stakeholders, budget funding decisions, and process continuity play a larger role in public sector investment success. Understanding these distinctions and adjusting investment value to fit the context of public or private sector origination will improve investment success and management decision-making.

Inflation volatility is a more recent phenomenon and has occurred at this magnitude only one in the last 40 years. In the private sector, it quickly impacts corporate cost of capital, CapEx budgets, and default risk. Even though the public sector is more insulated from capital cost fluctuations, government acquisitions are a partnership between government and corporate stakeholders, and analysts need to understand and account for changes in discount rates to calculate NPV and assess project value. Recent and infrequent OMB-driven discount rate changes may not be adequate to calculate value and prioritize F&E capital. Conducting a rate sensitivity analysis would yield a more accurate result.

7 References

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8 Appendix A – Annual Inflation Rate Table

The following inflation table is referenced from the US Inflation Calculator (https://www.usinflationcalculator.com/inflation/current-inflation-rates/), and the key is listed from the same source, “To find annual inflation rates for a calendar year, look to the December column. For instance, the inflation rate in 2024 was 2.9%. Meanwhile, the "Ave" column shows the average inflation rate for each year using CPI data. In 2023, the average inflation rate was 4.1%. These average rates are published by the BLS but are rarely discussed in the news media, taking a back seat to the actual rate of inflation for a given calendar year.” The inflation examples in this paper utilized the average annual inflation rate to capture a more consistent annual inflation impact during periods of volatile rates, especially between 2020 and 2025.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
2025	3	*Avail. March 12*											
2024	3.1	3.2	3.5	3.4	3.3	3	2.9	2.5	2.4	2.6	2.7	2.9	2.9
2023	6.4	6	5	4.9	4	3	3.2	3.7	3.7	3.2	3.1	3.4	4.1
2022	7.5	7.9	8.5	8.3	8.6	9.1	8.5	8.3	8.2	7.7	7.1	6.5	8
2021	1.4	1.7	2.6	4.2	5	5.4	5.4	5.3	5.4	6.2	6.8	7	4.7
2020	2.5	2.3	1.5	0.3	0.1	0.6	1	1.3	1.4	1.2	1.2	1.4	1.2
2019	1.6	1.5	1.9	2	1.8	1.6	1.8	1.7	1.7	1.8	2.1	2.3	1.8
2018	2.1	2.2	2.4	2.5	2.8	2.9	2.9	2.7	2.3	2.5	2.2	1.9	2.4
2017	2.5	2.7	2.4	2.2	1.9	1.6	1.7	1.9	2.2	2	2.2	2.1	2.1
2016	1.4	1	0.9	1.1	1	1	0.8	1.1	1.5	1.6	1.7	2.1	1.3
2015	-0.1	0	-0.1	-0.2	0	0.1	0.2	0.2	0	0.2	0.5	0.7	0.1
2014	1.6	1.1	1.5	2	2.1	2.1	2	1.7	1.7	1.7	1.3	0.8	1.6
2013	1.6	2	1.5	1.1	1.4	1.8	2	1.5	1.2	1	1.2	1.5	1.5
2012	2.9	2.9	2.7	2.3	1.7	1.7	1.4	1.7	2	2.2	1.8	1.7	2.1
2011	1.6	2.1	2.7	3.2	3.6	3.6	3.6	3.8	3.9	3.5	3.4	3	3.2
2010	2.6	2.1	2.3	2.2	2	1.1	1.2	1.1	1.1	1.2	1.1	1.5	1.6
2009	0	0.2	-0.4	-0.7	-1.3	-1.4	-2.1	-1.5	-1.3	-0.2	1.8	2.7	-0.4
2008	4.3	4	4	3.9	4.2	5	5.6	5.4	4.9	3.7	1.1	0.1	3.8
2007	2.1	2.4	2.8	2.6	2.7	2.7	2.4	2	2.8	3.5	4.3	4.1	2.8
2006	4	3.6	3.4	3.5	4.2	4.3	4.1	3.8	2.1	1.3	2	2.5	3.2
2005	3	3	3.1	3.5	2.8	2.5	3.2	3.6	4.7	4.3	3.5	3.4	3.4
2004	1.9	1.7	1.7	2.3	3.1	3.3	3	2.7	2.5	3.2	3.5	3.3	2.7
2003	2.6	3	3	2.2	2.1	2.1	2.1	2.2	2.3	2	1.8	1.9	2.3
2002	1.1	1.1	1.5	1.6	1.2	1.1	1.5	1.8	1.5	2	2.2	2.4	1.6
2001	3.7	3.5	2.9	3.3	3.6	3.2	2.7	2.7	2.6	2.1	1.9	1.6	2.8
2000	2.7	3.2	3.8	3.1	3.2	3.7	3.7	3.4	3.5	3.4	3.4	3.4	3.4

**Data Source: U.S. Bureau of Labor Statistics: All items in U.S. city average, all urban consumers, not seasonally adjusted.*