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Evaluating The Relative Performance of Public-Private Partnerships and Conventional Project Delivery during Crises

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16. Abstract

This research report investigates whether the financial health of transportation projects varies based on their financial structures during times of crisis. Specifically, the study focuses on three projects in Virginia: the Hampton Road Bridge Tunnel (a publicly financed project), the Chesapeake Bay Bridge Tunnel Expansion (a revenue bond project), and Transform 66 Outside the Beltway (a P3 project).

Two key indicators were analyzed: credit rating and credit spread. The study found that the credit rating remained stable for all three projects, indicating that the overall creditworthiness and risk assessment of each project, as evaluated by financial institutions, did not change significantly due to the crisis.

However, the credit spread analysis, while initially promising, were not sufficiently robust due to shed light on the research questions.

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CHAPTER 1

Introduction

As the COVID-19 pandemic demonstrated, crises can dramatically impact the financial health of transportation infrastructure projects and alter the conditions under which they develop and operate, leading to reduced user demand, subsequent tax revenue changes, attenuated government budgets, and constrained private investment (Gifford et al., 2023).

Because Public-Private-Partnership (P3) and conventionally delivered projects employ differing funding and financing strategies, crisis may influence these two project categories differently. P3 projects usually involve partnerships between private concessionaires (i.e., the private sector) and federal, state, or local governments (i.e., the public sector). Unlike conventional projects that are typically constructed using general obligation funds, dedicated tax revenues, and/or government debt, P3 projects frequently receive the bulk of their upfront financial resources via private equity and private/public debt. Therefore, P3 projects shift part of the financial risks from the public to the private sector(Elkins et al., 2018). Given the risky nature of large-scale transportation infrastructure development, risk transfer is often a strong incentive for governments to use P3 delivery approaches. Unlike P3 projects, conventionally delivered projects rely on public revenues and resources, such as taxes, bonds, or user fees, for most of their funding.

Since P3 and conventionally delivered transportation projects often demonstrate widely divergent public-private risk transfer profiles, their financial indicators may also differ, especially during times of crisis. Therefore, this research aims to evaluate whether the financial health of P3 and conventional projects differs during times of crisis. For this research, project financial health is evaluated using two indicators: (1) credit ratings and (2) credit spreads. Whether public-sector risk-taking reduces the risk indicators of the project cost is still up for debate. From an investor's perspective, projects backed by revenue pledges or the public sector's full-faith and credit (i.e., taxing power) might present less risk during crises compared to projects financed solely by the private investment market.

Because the term 'transportation infrastructure' encompasses a wide variety of facilities—e.g., bike lanes, subways, ports, airports, etc.—the scope of this analysis was limited to road projects for ceteris paribus comparison. Additionally, we reduced the geographical variation by choosing the three surface projects in Virginia as our target cases. In this paper, we investigated three road construction cases: the Hampton Road Bridge Tunnel (HBRT), the Chesapeake Bay Bridge Tunnel Expansion (CBBT), and the Transform 66 Outside the Beltway. Each respective case used a distinct type of financing, namely public finance, revenue bonds, and a P3.

The difference between a P3 project and a conventionally financed project during a crisis would provide a market-based indicator of the measurable values of the risk retained by the public sector. Such retained risks are often not explicitly considered in the discussion of delivery options (Elkins et al., 2018).

Objectives

This research aims to contribute to the understanding of performance of different financial structures during crisis by tracking dynamic changes in financial markets for P3 and conventional debt during times of crisis and draws conclusions about the relative impact of crisis conditions on conventional and P3 projects.

CHAPTER 2

Literature and Evaluation Framework

Crisis & Transportation Projects

In the past, various crises have had a significant impact on transportation projects. The literature discussed in this paper examines how these crises affect conventional and P3 infrastructure projects. Special attention was paid to the influence of economic, environmental, and health crises on traveler demand and financial delivery methods. The unpredictability and severity of these crises made it imperative to understand past events as a foreshadowing into future circumstances that could hamper these projects. How these crises influence consumer habits and public expenditures is important for determining the viability of transportation projects and their management under stressful conditions.

First, outcomes of financial crises on transportation infrastructure projects were reviewed, with a special emphasis on how the Great Recession influenced individuals' traveling habits and the lending practices of banks in the wake of the economic downturn. The 2007 subprime mortgage crisis was the impetus for the financial crisis that began in 2008 and caused instability among financial institutions and a decline in the labor force. A stagnant recovery subsequently hurt businesses and resulted in a loose labor market for several years.

Local and state governments relied heavily on tax revenue from businesses and individuals, and the Global Financial Crisis significantly undermined their ability to fund conventional infrastructure projects. Six years after the Global Financial Crisis began, nominal spending was less than its pre-Recession levels ($ 325 billion in 2007; $ 323 billion in 2013), and real capital spending had also declined (state-local per capita spending was $1,162 in 2007 but $952 in 2013) (Fisher, 2016). Moreover, the American Public Transportation Association surveyed private businesses that support transit agencies in 2011. They found that a majority experienced diminishing revenue and an expectation of restricting or decreasing employment(American Public Transportation Association, 2011).

With increased uncertainty over generating revenues, P3s emerged as a desirable alternative. Cramer found that states were passing legislation related to P3s at a much higher rate after the Global Financial Crisis of 2008, which includes the establishment of P3 regulatory bodies (Cramer, 2017). As a result of the worsening economic situation, governments found it more palatable to deflect spending onto private concessionaires to mitigate risk and reduce government obligations. In some countries, though public investment in transportation infrastructure declined, a greater proportion was spent on P3s (Ortega et al., 2016).

Despite this wider acceptance of P3s, several studies noted headwinds they encountered because of the Great Recession. Burger et. al. specified four threats that undermined P3s after the Global Financial Crisis: higher interest rates, enhanced credit constraints, reduced cash flows due to less demand and exchange rate adjustment that impeded the procurement of construction materials (International Monetary Fund, 2009). Many banks, nervous about long-term investments, preferred loans with a shorter maturity. Murphy notes how this mini-perm financing (extension of bank loans on a short-term basis) increased in popularity after the financial crash (Murphy, 2010). In such an environment, it became more difficult and expensive for P3 projects to secure the extended financing needed for their costs, eventually resulting in projects being cancelled or put on hold. Iteratively, the private sector demanded additional support from governments to cover project funding gaps. However, whether Cramer's findings were induced by the Global Financial Crisis is questionable. A similar surge of interest rates for P3s occurred in the 1990s when the U.S. economy was strong (Cramer, 2017).

Second, climate change is an important public policy issue in the 21st century, and the prevalence of environmental crises will only increase in the coming decades. Though these crises will impact transportation projects across the country, the most significant damage is anticipated along the coastline. A report from the Transportation Research Board (TRB) found a near-certain probability that sea levels will rise, and hurricane intensity will increase in the coming decades. Financial analysis of Hurricanes Katrina and Rita show that damage to bridges, railways, ports, pipelines and airports exceeded $2 billion(Transportation Research Board, 2008).

The literature on climate change recommends abandoning or moving coastal transportation systems that could be at risk (Wenger, 2011). This could hamper current or future transportation infrastructure projects such as the P3 tunnel project in Hampton Roads, Virginia. However, TRB's Special Report 290 suggested that transportation planners and engineers should be required to consider scenarios that plan for climate crises decades into the future (Transportation Research Board, 2008). Given the expenses involved in solidifying infrastructure against future severe climate scenarios, it would be imperative for the private sector to provide some needed financing and operational assistance.

The COVID-19 pandemic also upended how often people travel and their method of transportation. Ali et. al. concluded that the pandemic would affect a person's personal motivations and influence their travel habits (2020). During the pandemic, people still used cars, and there is some evidence that it increased in frequency due to concerns regarding public transportation (Circella & Dominguez-Fau, 2020). Weary of close contact with others, air travel and public transit ridership collapsed in the wake of the health crisis. The pandemic shifted transportation away from shared platforms towards private usage like personal vehicles.

Moreover, work-from-home arrangements decreased the number of commuters during the day, thereby lowering the usage of conventional and toll roads. Governments had to reduce or waive public transit fares. Whether they need to finance alternative methods of travelling (like more dedicated bicycle lanes) is unclear and will largely depend on whether people alter their travel habits permanently. Likewise, future health crises can further influence travel behavior away from shared usage or commuting to an office space, dampening the demand for conventional and P3 infrastructure projects. Casady and Baxter recommend a triage approach to evaluate the financial viability of P3 projects once the pandemic abates. To them, it is crucial for state and local governments to recognize projects in need of stabilization and those whose failure is inevitable (Baxter & Casady, 2020). In this way, governments can make more efficient financing decisions reflecting changing consumer habits.

The public response to this crisis, people's expectations, and the tolerance of risk will ultimately determine demand for a P3 or conventional transportation project (Roszkowski & Davey, 2010).

As the literature suggests, different crises have slightly differing impacts on the risk profile and subsequent financial health of P3 and conventional projects. In common, however, they increase the uncertainty in expected returns, leading to financial constraints on these projects.

Financial Sources and Project Structure

Conventionally funded transportation projects are projects that are funded by the government, usually by the state, though local and federal governments also play a part. Funding can come from nearly any source such as: general funds, vehicle registration, sales tax, lottery/casino revenue, vehicle leasing and rental fees, tollway revenues, parking fees/fines, and property taxes. Traditionally, in the United States, this funding is pay-as-you-go rather than financed. For instance, the majority of highway funding is pay-as-you go, while bond revenue was only about 12% of total revenue collected for highway purposes in 2014 (Mallett & Driessen, 2016). The other way to pay for highways is financing or borrowing money/capital with the intent to repay.

	Federal	State	Local	Total
Highway user revenues	$32,833	$68,432	$5,158	$106,423
Motor-fuel and vehicle taxes	*$32,833*	*$56,168*	*$3,077*	*$92,078*
Tolls	*$0*	*$12,264*	*$2,081*	*$14,345*
Other taxes and fees	$21,041	$19.973	$56,824	$97,838
Investment income and other receipts	$1,021	$10,132	$7,100	$18,253
Bond issue proceeds	$0	$22,867	$7,261	$30,127
Total	$54,895	$121,404	$76,343	$252,642

TABLE 1 - REVENUE USED FOR HIGHWAYS/STREETS BY COLLECTING AGENCY IN 2014 (IN USD MILLIONS) (MALLETT & DRIESSEN, 2016)

There are three main ways transportation projects are financed. The first is public financing. In this case, projects are backed by general obligation bonds and the full faith and credit of the issuer (usually the state). The repayment of financing is funded by revenue not directly tied to the project, such as taxes. The second way a project can be financed is through revenue bonds and funded by user fees, such as toll revenue. The creditworthiness of these projects is directly linked to the revenue generated by user fees. The third option is to incorporate private financing via public-private partnerships. Public-private partnerships or P3s are relationships between a governmental owner (typically at the state or local level) and a private company (Mallett, 2021). While there are many forms a P3 can take, the ones examined here are design-build-finance-operate-maintain (DBFOM) contracts. In DBFOM projects, the financing can be shared between the public and private sector or completely provided by the private sector.

CHAPTER 3

Methodology

Risk Indicators & Underlying Mechanism

To evaluate the financial health of various projects, two risk indicators were used: (1) credit ratings and (2) credit spreads. Changes in these risk indicators towards higher risk classifications is expected to negatively affect the financial health of projects examined in this research.

A credit rating is an ordinal indicator indicating the creditworthiness of a bond in the financial market. It evaluates a set of standardized risk criteria for public and private bonds to generate alphabetic grades. The credit rating was first issued in the early 1900s by at-the-time private rating companies such as Moody's, Fitch Publishing Company, and Poor's Publishing Company (Cantor & Packer, 1996). With the establishment of the U.S. Securities and Exchange Commission (SEC) in 1934 and several institutional changes, the indicator became nationally recognized and took a significant role in bond risk evaluation in the U.S. and global financial markets. Now nine Nationally Recognized Statistical Ratings Organizations (NRSROs) are registered at the SEC and issue rating reports for the U.S. public bond markets.

Nowadays, the credit rating is one of the most representative indicators and out-of-hand investment determinants for entities within the market. If major ratings giants maintain investment grade ratings, investors tend to keep their bond investments. White's example of the 2008 housing bubble is a good example of the rating agencies maintaining their investment grade ratings until the bubble burst (White, 2009). Cantor and Packer also show that ratings changes by the giants alter the credit spreads of countries significantly (1996). Therefore, this research considered credit ratings as one of the necessary indicators of financial health for transportation infrastructure projects.

Another influential and more detailed risk indicator is credit spreads. The credit spread represents the difference in yields for a bond from U.S. Treasury bonds. Academics, business economists, and policymakers consider it as the "default risk indicator", because it is often a good predictor of expected

future economic performance by investors (Gilchrist & Zakrajšek, 2012). During the pandemic, the treasury yield declined significantly and showed an inverted-U shape recovery. The initial drop in yields reflected a flight to safety, as investors sought the security of government bonds amidst the economic turmoil. After this initial decline, yields began to rise again, particularly at the longer end of the curve, while shorter-term yields remained relatively low. This type of recovery occurred because of the complex interplay between economic recovery expectations, inflation fears, and Federal Reserve policies. Depending on the relative performance of transportation infrastructure projects at this time, differences in credit spreads could have been large or small and positive or negative.

Using credit spreads as a risk indicator was also advantageous because P3 and conventional project sponsors often form a special purpose vehicle (SPV) for project delivery. Other credit analysis, which looks at a company's balance sheet, income statements, and debts, might have trouble evaluating an "off-books" SPV. However, in the literature, there have been attempts to use credit spreads to build evaluation models for infrastructure project financing (Bouzguenda, 2014; Kong et al., 2008).

To measure the immediate and current impacts of COVID-19 pandemic, this paper investigated the bond credit spreads of trading dates in March 2020, December 2020, and October 2021, using the last transaction in each month. The calculation used the "Daily Treasury Yield Curve Rates" of the U.S. Department of Treasury (U.S. Department of the Treasury, 2024) and the U.S. Securities and Exchange Commission (SEC) Electronic Municipal Market Access (EMMA) bonds yield curve pages (Electronic Municipal Market Access, 2024d).

Case Study Analysis Framework

This analysis follows a traditional social science case study approach of comparison. The authors started by exploring transportation infrastructure projects in the U.S. using a variety of data sources. The cases were then narrowed down for comparison. Specifically, the authors looked at surface transportation projects,

within the last 20 years, that were ongoing during a crisis. The final three projects represent three different major financing types: public, bond revenue, and P3. All three projects were located in Virginia to control potential variations at the state-level (e.g., state ratings, etc.).

The collection of risk indicators and calculation of spreads, although constrained by limited publicly available financial data, went through formal and informal reviews from experts in various ratings- and spreads-issuing organizations.

Case Selection

The case selection process involved several steps. The first was to look at transportation infrastructure projects across the United States. The authors used three main data sources: the Public Work Financing Project Database, the University of Maryland Transportation Project Database, and an internal database developed for prior research. These projects contained nearly 500 projects, with some minor overlaps. For the purpose of this study, projects were narrowed down to only surface transportation projects, implemented within the last 20 years, that were ongoing (either in construction or operational) during a crisis. Due to laws varying from state to state and risk indicators potentially being affected by state-level risk variation, the study's scope was limited to Virginia. The state was picked based on its depth of P3 projects. Additionally, the COVID-19 pandemic was selected as the crisis because of its recent impacts and currently ongoing impacts.

Other candidate projects for the case study are shown in Table 2, along with why they were not chosen. For the purpose of the case study, the authors tried to find the most similar projects, that varied only in their type of financing. Projects were disqualified for several reasons, including not on-going during a crisis, construction completed, an addition to an existing project (for P3s), etc. The final three projects selected—i.e., the Hampton Roads Bridge Tunnel (HBRT), the Chesapeake Bay Bridge Tunnel Expansion (CBBT), and Transform 66 Outside the Beltway—represent the three different major financing types for

infrastructure projects. They were also chosen because they fit the criteria, had geographical and other similarities, and had accessible financial indicators such as bond ratings and credit spreads.

Project	Description	Why Not Chosen
Midtown Tunnel	P3 Toll Tunnel	Not on-going during crisis
I-64 widening	Large project with general obligation bonds	Completed in 2021
I-64 Southside Widening and High-Rise Bridge Phase 1 Project	Large project with general obligation bonds	Completed in 2021
Fred Ex	P3 Toll Road	Expansion on existing project
I-395	P3 Toll Road	Expansion on existing project

TABLE 2 - OTHER PROJECTS CONSIDERED FOR CASE STUDY

CHAPTER 4

Results

In general, the bond rating analysis allowed reasonable comparability across projects over time. However, there was relatively little change in the bond ratings of the three projects over the study period. The analysis of credit spreads identified significant challenges to meaningful comparisons within the scope of this project due to several important characteristics of bond transactions. First, in order to make meaningful apples-to-apples comparisons of changes in the spread risk premia over time, it is essential to ensure that observed changes in spreads are tranches of bonds with the same maturities, and that those spreads are calculated using Treasury rates of comparable maturity.

However, the different project bonds for the selected cases were issued at different times and in some cases different "tranches" of maturity. A bond issue for the Hampton Roads Bridge Tunnel, for example, had 18 different maturity dates ranging from 2025 to 2057. A further difference among the bonds was whether they were "callable," that is, whether the issuer had the right to repay the bond early after a predetermined period, say ten years, rather than continuing to pay them through the full term of the bond. This option for the tranche increases flexibility and capacity to respond to market changes for the issuer, but it may also lessen the market interest in the bond to investors seeking to lock in rates over a term that exceeds the term of the call, thereby affecting market demand and the resulting yield.

A second complication is that a particular bond issue and maturity may not trade very frequently, thereby limiting the number of trades of comparable maturity available for analysis. Furthermore, each sale and purchase of a lot of bonds reflects the assessment of a particular buyer and a particular seller at a particular moment in time. Transaction prices therefore may reflect a seller's need to raise cash at a particular moment, and the liquidity of the market for that particular bond. In aggregate, a large number of trades could yield useful indications of how creditworthiness changes over time through periods of crisis.

But drawing conclusions on the basis of one or a handful of transactions in a one-month analysis period could be misleading.

Given these features of the bond issues examined in these cases, the research team therefore concluded that the available volume and timing of the trades for these projects were not sufficiently robust to address the research questions. The following discussion therefore focuses on the bond rating analysis.

Case 1: Hampton Road Bridge Tunnel (HRBT) Expansion Project, Publicly Financed

1. Project Overview

The HRBT Expansion Project is the largest highway construction project in Virginia. The project widens an existing four-lane segment in I-64 along roughly ten miles between Norfolk and Hampton and constructs upgraded twin tunnels across the harbor (Hampton Roads Bridge Tunnel Expansion, 2024). The project creates an eight-lane facility with six consistent lanes, which separates to four general purpose lanes, two High-Occupancy Toll (HOT) lanes, and two drivable shoulders that can be used as HOT lanes during the daytime (U.S. Department of Transportation, 2021). The project anticipates enhanced mobility in the region, congestion relief, improved travel time stability, and the creation of 28,000 jobs over the project's duration. USDOT expects the project will facilitate regional development along with safety enhancement via improved evacuation routes.

HRBT is a Design-Build (DB) project between the Virginia Department of Transportation (VDOT) and Hampton Roads Connector Partners (HRCP). HRCP is a joint venture with Dragados USA, HDR, and Mott MacDonald as the leads. While HRCP is a private partner in this project, the financing of the project falls solely on the state. The anticipated construction duration is from late 2020 to 2025, and the project is scheduled to be completed in November 2025(Hampton Roads Bridge Tunnel Expansion, 2024). The initial planning on the entire Hampton Roads improvement goes back to 2014 when Hampton Roads Transportation Accountability Commission (HRTAC) listed it as a priority.

After the Supplemental Environmental Impact Statements (SEIS) and road segment constructions, Virginia state awarded a $USD 3.3 billion contract for HRBT in 2019 (Civil + Structural Engineer Magazine, 2019b).

2. Project Financing Structure

a. Overview

The project budget for the newly included tunnel segment is over USD $3.8 million, and the financing is 100% public funds. The primary funding body is Hampton Roads Transportation Accountability Commission (HRTAC), which delivers 95% of the total funding (Civil + Structural Engineer Magazine, 2019a) from regional sales and gas taxes via Hampton Roads Transportation Fund (HRTF). To bridge the revenue collecting time gap, USDOT's Transportation Infrastructure Finance and Innovation Act (TIFIA) program loaned $USD 1.16 billion to HRTAC, which is approximately 33% of the total project budget. Additional funding to the project includes USD $200 million from the Commonwealth's SMART SCALE program and USD $108 million from VDOT.

In fact, the Hampton Roads Priority Project was the starting series in the Hampton Roads construction and was supposed to be completed in September 2021 with total budget of USD $1.57 billion. TIFIA had loaned USD $500 million to HRTAC in 2016 and other senior debt bonds delivered USD $583 million. Federal Funds, State/Local Appropriation, and the PayGo scheme accounted for 1~2 million each, totaling to 1.57(U.S. Department of Transportation, 2024b). However, with the expansion of the project to include tunnels and the pandemic's impacts, TIFIA replaced the existing loan of USD $500 million with a new loan to HRTAC, allowing for more financial room for non-tunnel segment construction.

b. Bond Structure, Security, and Repayment

HRTAC issued four bond series for the project: Series 2018A, Series 2019A, Series 2020A, and Series 2021A(Electronic Municipal Market Access, 2024d). Series 2018A, the first revenue bond for the project, is a limited obligation bond with a total amount of USD $59 million and an initial offering yield of around 2.5%.

The bond security and repayment are solely based off of revenue from HRTAC, mostly composed of Additional Sales and Use Tax revenues, Additional Motor Vehicle Fuels, and the Commonwealth or any other political subdivisions not being restricted or limited by the debt (*HRTAC, Series 2018A Bond Statement*, 2018).

Series 2019A, the first series of the Intermediate Lien Obligation bond for the project, is a limited obligation bond totaling USD $4.2 billion with an initial yield offering of 1.27%. The bond security and repayment terms remain the same as 2018A, but the scope of 'HRTAC revenue' became broader to include transfers from the Commonwealth, investment returns, and other supplemental revenues stated by HRTAC Acts (*HRTAC, Series 2019A Bond Statement*, 2019). The increased bond issue volume and broadened scope of the revenue relates to the relative guarantee of repayment in maturity vis-à-vis the 2019 TIFIA loan (before it was replaced). 2019A bonds are senior to TIFIA if issued with a waiver of the 'Springing Lien' terms.

Series 2020A is a limited obligation bond totaling USD $6.1 billion with an initial yield offering of around 1.2%. The bond was issued with updated planning for the HRBT Extension by the Commonwealth of Virginia in June 2020. The bond security and repayment terms remain the same, but the 2020A bonds are senior to the 2019A bonds along with 2018 and other senior lien bonds (*HRTAC, Series 2020A Bond Statement*, 2020).

Lastly, the Series 2021A is a limited obligation bond totaling USD $818 million with an initial yield offering of 0.5%. The bond security and repayments are like Series 2020A with HRTAC revenues, and the 2021A bonds are senior to the 2019A bonds with all other bonds. The bond repayment in the maturity is senior to the 'successor' TIFIA loan approved in 2021 (*HRTAC, Series 2021A Bond Statement*, 2021).

3. Project Financial Health during the Pandemic

a. Decline in the Two Major Revenue Streams

According to the bond statement for the Series 2021A, the pandemic decreased revenue from sales and motor taxes. Although both were affected, Table 3 shows that motor fuel tax revenue had higher damage than the sales tax revenue.

Additional Sales and Use Tax (millions)

Month of Sales	FY 2019	FY 2020	FY 2021*	2020 vs. 2019	2021 vs. 2020
July	$12.0	$13.0	$13.2	8.3%	1.5%
August	12.1	13.1	13.3	8.3	1.5
September	11.1	12.1	13.4	9.0	10.7
October	11.3	12.1	13.4	7.1	10.7
November	11.3	12.5	13.4	10.6	7.2
December	13.7	14.6	16.2	6.6	11.0
January	9.8	10.5	12.0	7.1	14.3
February	9.5	10.0	11.6	5.3	16.0
March	11.8	11.3	15.9	-4.2	40.7
April	12.2	10.5	15.3	-13.9	45.7
May[(1)]	19.2	17.8	22.1	8.2[(2)]	24.2
June	5.2	8.6	11.8	8.2[(2)]	37.2
Total	$139.2	$146.2	$171.6		

Additional Motor Vehicle Fuels Tax (millions)

Month of Sales	FY 2019	FY 2020	FY 2021*	2020 vs. 2019	2021 vs. 2020
July	$4.9	$5.3	$4.9	9.31%	(7.4)%
August	5.0	5.4	4.8	7.49	(-9.4)
September	16.9[1]	5.0	5.0	(15.3)	(-1.5)
October	6.2	5.1	4.8	(17.6)	(-6.8)
November	4.0	4.7	4.2	20.2	(-10.6)
December	7.2	5.0	4.7	(30.8)	(-6.8)
January	5.2	4.5	4.3	(12.8)	(-4.6)
February	4.6	4.3	3.7	(7.9)	(-14.0)
March	4.9	4.5	5.0	(7.5)	10.8
April	5.8	4.1	4.8	(29.7)	19.3
May	4.5	3.1	5.2	(31.1)	64.7
June	4.9	3.9	4.5	(19.4)	15.4
Total	$74.0	$55.0	$55.9		

TABLE 3 - THE HAMPTON ROADS TRUST FUND REVENUES BY MONTH SOURCE: (HRTAC, SERIES 2021A BOND STATEMENT, 2021)

The bond statement describes the unpredictability of the impact and duration for the COVID-19 pandemic as a major challenge for revenue decline and the project's financing.

b. Credit Ratings

Despite the major tax revenue losses, the credit ratings for the revenue bonds series have been stable. Fitch rates the Series 2018A as AA+ consistently from 2017 through 2021(Fitch Ratings, 2024a). Moody's maintains the Aa3 ratings for the Series 2019A and Aa2 for the Series 2020A and Series 2021A. During the same periods, 2019 TIFIA loans were upgraded from A1 in 2019 to Aa3 by Moody's and the new 2021 TIFIA loan was rated as BBB- by Fitch. The 2019 TIFIA loan upgrade seems to have happened due to refinancing by the USDOT. However, Fitch indicates new federal support having mid-level risks.

c. Conclusion

Overall, the large-scale municipal projects for the road and tunnel improvements showed rather higher profitability than other deferral bonds in the financial market during the pandemic. The project follows a publicly financed structure with financial responsibility completely on the state.

According to Fitch, the project has had a long duration of construction, and the schedule delay will potentially downgrade its creditworthiness. However, the fact that HRTAC is had committed financial support from VDOT and the HRTF was appropriated from the Virginia General Assembly and supported by Governor Northam seemed to maintain market confidence for the bonds. The state of Virginia maintains high credit ratings in the bond market.

Case 2: Chesapeake Bay Bridge Tunnel Expansion (Parallel Thimble Shoal Tunnel Project), Revenue Bond

1. Project Overview

The Chesapeake Bay Bridge Tunnel Expansion (CBBT) is designed to add two tunnel lanes for travelers crossing the Chesapeake Bay in both directions. In addition to the existing roads, it will increase capacity by constructing a parallel two-lane tunnel (under the Thimble Shoal Channel) adjacent to the current one, as depicted below:

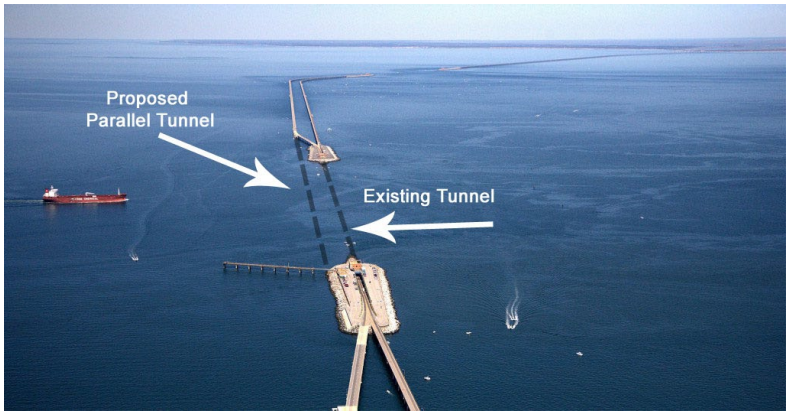

FIGURE 1 - THE CHESAPEAKE BAY BRIDGE TUNNEL EXPANSION'S TUNNELS ((U.S. DEPARTMENT OF TRANSPORTATION, 2024A)

Upon its completion, there will be two lanes of northbound traffic and two lanes of southbound traffic, effectively doubling capacity. The impetus for this project is to ameliorate congestion experienced by drivers due to accidents, maintenance, contracting work, or delays caused by oversized vehicles. It is the only viable route along the lower Chesapeake Bay connecting Virginia Beach with the state's portion of the Eastern Shore and is travelled by millions of drivers annually (CBBT, 2024; U.S. Department of Transportation, 2024a).

Planning for this extension began back in 2013 and construction started in 2017 but has since experienced delays, prolonging its completion. With the necessity of a large boring machine to drill the tunnel and conflicts with the contractor, the project is now slated to be completed by 2024. It is a Design-Build project under the Chesapeake Tunnel Joint Venture, which includes Dragados USA and Schiavone Construction Company, LLC as members of the team.

2. Project Financing Structure

a. Overview

The project will cost around USD $1.08 billion and be delivered primarily through public funds. Much of the financing will come from a Transportation Infrastructure Finance and Innovation Act (TIFIA) loan ($338.5 million) and toll revenue bonds ($321.5 million). The primary revenue pledge for the TIFA loan is also toll revenue(U.S. Department of Transportation, 2024a). Once the TIFIA loan had been repaid in full, all money deposited in the General Fund can be used for any purpose related to the CBBT. The remainder of the project's funding will be derived from the Chesapeake Bay Bridge and Tunnel District General Fund ($226.9 million) and $137.1 million from other sources (U.S. Department of Transportation, 2024a). Direct state financing in the form of a Virginia Transportation Infrastructure Bank (VTIB) loan (USD $50 million at an interest rate of 2.90% plus capitalized interest on the VTIB Loan that may accumulate prior to the substantial completion of the Project.) is allocated to bridge any revenue gap(VDOT, 2024c).

b. Bond Structure, Security, and Repayment

The Chesapeake Bay Bridge and Tunnel District issued two bonds to cover the cost of this project: Series 2016, and Series 2019 (Electronic Municipal Market Access, 2024a). Series 2016 was issued as a First-Tier bond at a yield of 3.16 percent for the amount of USD $89.5 million. Repayment of the debt will be constituted through toll revenue streams from the project(Electronic Municipal Market Access, 2024b). Any factor that could divert traffic away from the Bridge may adversely impact the repayment of this bond.

Series 2019 is a limited obligation bond with an issuance of USD $378 million at a 1.35% yield(Electronic Municipal Market Access, 2024c).

They are the second series of First Tier bonds issued after Series 2016. Like Series 2016, they are also considered senior obligations. The repayment of this bond will consist of any revenue generated by the CBBT in the form of rates, fees, tolls, and other charges collected by its usage(Electronic Municipal Market Access, 2024c).

3. Project Financial Health during the Pandemic

a. Credit Ratings

The bond credit ratings have changed somewhat since their issuance. Moody's rated the Series 2016 bond at A2, reflecting low credit risk. However, they subsequently altered this rating and downgraded it to Baa2 which reflects a moderate credit risk, before raising it back to A2. S&P's ratings closely aligned with Moody's; initially issued at AA, they proceeded to downgrade the bond to BBB before raising it to AA again(Electronic Municipal Market Access, 2024a). For the Series 2019, Moody's rated it at Baa2 while S&P did so at BBB. These were First Tier bonds issued in 2016 and were subject to traffic forecasting before the COVID-19 pandemic occurred(Electronic Municipal Market Access, 2024a).

b. Financial Outlook

Before the pandemic, toll revenue and crossings on the Chesapeake Bay Bridge Tunnel had steadily increased (Electronic Municipal Market Access, 2024c). However, the COVID-19 pandemic upended many aspects of transportation, including people's willingness or need to travel. Work from home orders meant that millions of drivers dispensed with travelling to work, resulting in less traffic, a decline in gas tax and toll revenue. Bonds were issued for this project before the pandemic and did not anticipate such severe declines in traffic. However, with stay-at-home orders now a thing of the past, many people have returned to the office and have made more frequent trips for leisure or retail purchases. Ultimately, the number of people who return full-time or part-time to the office is likely to determine the long-term financial health of this project.

Case 3: Transform 66 Outside the Beltway, P3

1. Project Overview

Transform 66 Outside the Beltway is a public-private partnership (P3) project between the Virginia Department of Transportation (VDOT), the Department of Rail and Public Transportation (DRPT), and I-66 Express Mobility Partners(VDOT, 2024b). The project expanded 22.5 miles of I-66 in Virginia from the I-495 Capital Beltway to US 29 in Gainesville by adding two express lanes (tolled) and expanding three general purpose lanes in each direction. Additionally, the project also expanded bus service and transit routes, park-and-ride lots, and 11 miles of new bike and pedestrian trails along with 4,000 park-and-ride spaces.

FIGURE 2 -TRANSFORM 66 OUTSIDE THE BELTWAY PROJECT MAP. PROJECT AREA IS HIGHLIGHTED IN BLUE. (VDOT, 2024B)

With its completion, the project is expected to reduce congestion and move 2,000 to 4,000 more people. The project is the first major P3 project under Virginia's reformed P3 process which was designed to increase accountability, transparency and competition in P3 projects(VDOT, 2024b). Transform 66 Outside the Beltway is a Design-Build-Finance-Operate-Maintain (DBFOM) project for a 50-year concession.

Private partners in the I-66 Express Mobility Partners (EMP) consortium include Meridiam Infrastructure North America Fund II, Cintra Global Ltd., Cintra Infraestructuras S.E., APG Group, and John Laing as equity investors. Ferrovial Agroman US Corp. and Allan Myers VA, Inc. are the design-builders. VDOT signed the Initial Finding of Interests in August 2015. Commercial close was achieved in December 2016. Financial close occurred in November 2017, with construction activities commencing in December 2017. The project opened to the public in December 2022 (Meridiam, 2022; VDOT, 2024b).

2. Project Financing Structure

a. Overview

The project cost around USD $3.724 billion. Its financing sources include a Transportation Infrastructure Finance and Innovation Act (TIFIA) loan (USD $1.229 billion), Private Activity Revenue Bonds (USD $737 million), Virginia State Infrastructure Bank loan (SIB) (USD $39 million) and equity contributions (USD $1.525 billion)(VDOT, 2024b). The project requires no public funding. In exchange, the EMP will have to right to collect and set dynamic tolls on the express lanes for 50 years. The EMP made a concession payment to the Commonwealth of Virginia of USD $500 million, and under the comprehensive agreement, will contribute USD $ 800 million for transit services in the corridor and USD $350 million in other projects to improve the corridor over the next 50 years(VDOT, 2024a).

b. Bond Structure, Security, and Repayment

The TIFIA loan agreement was signed in 2017 with the preliminary/expected rating of BBB by Fitch and a baa3 rating by Moody's. This loan was secured by pledged net toll revenues. The Virginia Small Business Financing Authority issued four tax-exempt senior lien private activity revenue bonds: Series 2017: USD $38 million with a yield of 3.71%, USD $130 million with a yield of 3.79%, USD $222 million with a yield of 3.90%, and USD $352 million with a yield of 4%. Bonds are limited non-recourse obligations with the revenues pledged through toll revenues and other collaterals. The loan from the SIB was granted for early work and had no interest. It was required to be repaid after the TIFIA loan was disbursed(Electronic Municipal Market Access, 2024e).

3. Project Financial Health during the Pandemic

a. Credit Ratings

The credit rating has not changed for any of the bonds. According to the Fitch Ratings, the four private activity bonds and the TIFIA loan were rated as BBB between 2017 and 2021(Fitch Ratings, 2024b).

b. Financial Outlook

The initial date of trading was November 2017, when the project began. In March 2020, lockdowns were initiated around the country. The reduction in corridor traffic during the pandemic created supply chain problems that delayed some aspects of construction. However, lower levels of traffic in the corridor allowed construction to proceed more rapidly in some dimensions (Fitch Ratings, 2024b).

c. Conclusion

The project has since completed construction. During the pandemic, the project did not experience any delay. The construction was able to stay on schedule due to fewer cars on sites and allowing VDOT to expand lane closures hours without impacting traffic. Perhaps the stable progress of construction factored into lower observable risk. Overall, the project was quite resilient during the pandemic and outlooks are positive as people head back to office and more cars travel on the highways.

Findings

In this research, financial indicators were used to look at project health and financial risk. The first indicator examined was credit ratings, showing that all three projects were relatively stable. The HRBT Expansion Project's credit rating for its bonds has been relatively stable for the entirety of the project. The Series 2018A stayed AA+ consistently from 2017 through 2021, according to Fitch (Fitch Ratings, 2024a). The Series 2019A stayed at Aa3, while the Series 2020A and Series 2021A maintained Aa2, as rated by Moody's. The only change was in the 2019 TIFA loan, which was upgraded from A1 in 2019 to Aa3 by Moody's. This was unrelated to the crisis. The second project, the Chesapeake Bay Bridge Tunnel Expansion, has seen its bond credit ratings change somewhat since their issuance. However, this change does not coincide with the crisis. Moody's originally rated the Series 2016 bond at A2, reflecting low credit

risk. The series was then downgraded to Baa2 and then raised back to A2. S&P's ratings follow this same pattern. Initially issued at AA, it was downgraded to BBB and then raised to AA again(Fitch Ratings, 2024a). The Series 2019 bonds were rated at Baa2 and BBB by Moody's and S&P, respectively. Lastly, Transform 66, the P3 project, had no change in credit rating for its financing. The four private activity bonds and the TIFIA loan have been rated at BBB from 2017 to 2021 by Fitch (Fitch Ratings, 2024b).

The analysis of credit spreads, while initially promising, turned out not to provide useful insights to the comparative risk trajectory of the projects over the study period. The bonds were too thinly traded, and the multiplicity of bond tranches too numerous to allow meaningful comparison.

Implications

The first indicator, credit rating, shows the creditworthiness of a project. For the three projects examined, the credit ratings were fairly stable, with no change coinciding with the COVID-19 pandemic. The stability in credit ratings for large infrastructure projects is not unusual, according to experts consulted for this project. It shows that while there are external forces at play, the overall creditworthiness or riskiness of a project, as determined by a financial institution, did not change due to this crisis. Also inferred from literature, because the Commonwealth of Virginia maintains high credit ratings, this affects its transportation projects.

The second indicator used was credit spread. As noted above, the credit spread analysis did not provide sufficient information to support meaningful comparison.

All three projects received TIFIA loans, and the HRBT was the only one to refinance. Therefore, it seems that federal loan support did not affect these particular spreads variation during the pandemic. Potentially, the HRBT and Transform 66 can also be very different why the relative risk was lower during the pandemic.

CHAPTER 5

Conclusion

This research project has evaluated whether the financial health of financed projects differs by financial structure during times of crisis. To answer this question, this study examined three specific projects in Virginia to see how different financial structures were impacted by the crisis. Cases were chosen that were similar in all aspects apart from their financing structure. The first case—Hampton Road Bridge Tunnel (HBRT)—was publicly financed by the Commonwealth of Virginia. The second case, the Chesapeake Bay Bridge Tunnel Expansion (CBBT), was largely backed by revenue bonds and expected toll revenue. Lastly, Transform 66 Outside the Beltway was a P3 project financed by a private partner.

This analysis of these three projects shows little difference in terms of credit ratings, all of which were relatively stable. The credit spread analysis did not provide useful insight into the research question because of the thin trading and high variability in the three projects' bond issuances.

Along with geographic factors and revenue pledges, the differing financial structures of the projects created different risk profiles. While HBRT was 100% backed by public funds and the Transform 66 was backed largely by TIFIA and equity, including early installments, Chesapeake was backed by revenue which declined during the pandemic.

While this paper meets its goals in examining specific cases, it is limited in several regards. The first is that this is a small study comparing three cases in Virginia. Although the narrow scope is advantageous because it allows for thorough examination of each case, an expansion of regions and cases would be beneficial to determine the external validity of these findings. The Commonwealth of Virginia has a large government and military presence. Public sector jobs are relatively stable during crises when compared to private employment. The results could potentially be different in an area susceptible to volatility in changing labor market and unemployment conditions, therefore impacting traffic.

The second limitation of this paper is it looks only at projects under construction. The operations and management stage of a project may show differences that are not covered in this research. Future research should continue to investigate the impact of financial structures during times of crisis. One recommendation is to expand the sample size and perform a quantitative analysis. This would be challenging due to the complexity of large-scale infrastructure projects and the difficulty of finding mostly non-disclosed financial information. However, it would be useful to see if the findings apply more broadly.

Another option for further research is to explore other indicators of project health. A third addition could be extending this research to other states and looking to see if the credit ratings of the state impact the findings. A fourth extension would be to expand the credit spread analysis with an analytical model to account for the variability of bond issue tranches and apply it to a larger sample of projects. Lastly, this research question could be applied to different crises.

All three projects show signs of success despite the challenges brought on by the COVID-19 pandemic. This indicates there could be benefits to financing infrastructure as opposed to using a conventional pay-as-you-go model. Moving forward, governments should continue to explore all types of financing when planning large transportation projects, including accessing private financial resources through P3s.

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