

Financial Modeling: CAPM & WACC



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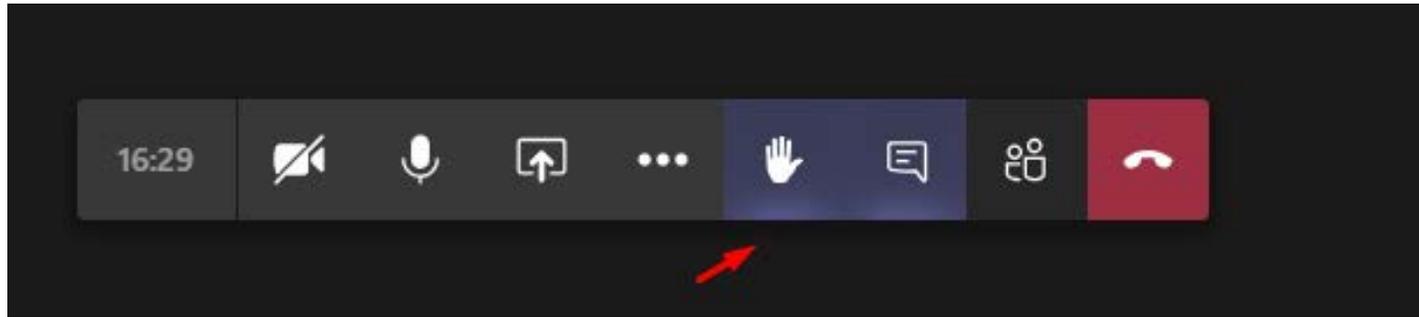
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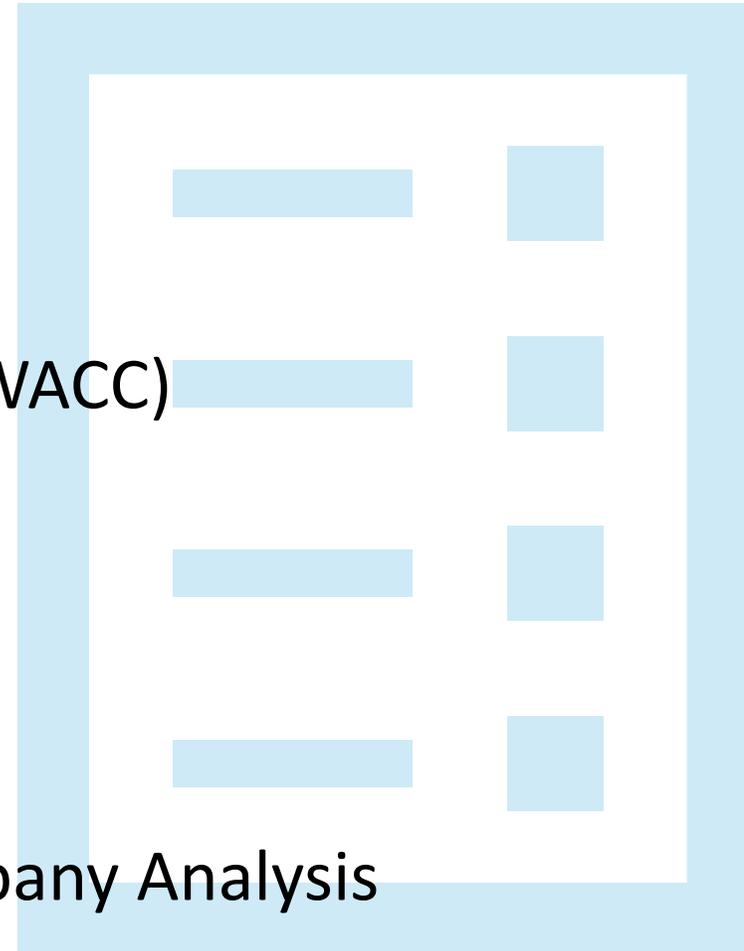


Kindly keep yourself on mute unless asking a question.



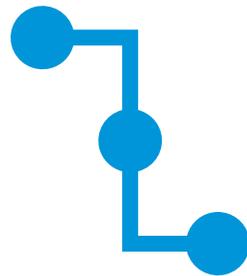
Today's Agenda

1. Capital Asset Pricing Model (CAPM)
 - Beta Analysis – Index and Time Periods
2. Weighted Average Cost of Capital (WACC)
 - Iteration Defined
3. Sovereign Spread
 - Hard Currency vs. Local Currency
4. Alternative to CAPM – Private Company Analysis



Capital Asset Pricing Model (CAPM)

1. Describes the relationship between *systematic risk* and expected return for assets, particularly stocks (SPV stock valuation).
2. CAPM is widely used throughout finance for pricing risky securities and generating expected returns for assets given the risk of those assets and cost of capital.



What Is Expected Return?

- The expected return is the amount of profit or loss an investor can anticipate receiving on an investment that has known historical rates of return (RoR).
 - RoR is calculated by multiplying potential outcomes by the chances of them occurring and then totaling these results.
 - Example: If an investment has a 50% chance of gaining 20% and a 50% chance of losing 10%, the expected return would be 5% = $(50\% \times 20\% + 50\% \times -10\% = 5\%)$.
- RoR is essentially a long-term weighted average of historical results, expected returns are not guaranteed.



Formula for Expected Return of an Asset

- The formula for calculating the expected return of an asset given its risk is as follows:

$$ER_i = R_f + \beta_i (ER_m - R_f)$$

- Where:
 - ER_i = expected return of investment
 - R_f = risk-free rate
 - β_i = beta of the investment
 - $(ER_m - R_f)$ = market risk premium



Understanding the CAPM (continued)

- Investors expect to be compensated for risk and the [time value of money](#).
 - The [risk-free rate](#) in the CAPM formula accounts for the time value of money.
 - Other components of the CAPM formula account for the investor taking on additional risk.
- The [beta](#) (β) of a potential investment is a measure of how much risk the investment will add to a portfolio that looks like the market.
 - If a stock is riskier than the market, it will have a beta greater than one.
 - If a stock has a beta of less than one, the formula assumes it will reduce the risk of a portfolio.



Beta is a statistical measure of the volatility of a stock versus the overall market

- Beta is generally used as both a measure of systematic risk and a performance measure.
 - The market has a beta of 1.
 - The beta for a stock describes how much the stock's price moves compared to the market.
 - If a stock has a beta above 1, it's more volatile than the overall market.
 - Example: if an asset has a beta of 1.3, it's theoretically 30% more volatile than the market.
 - A beta below 1 means a stock is less volatile than the overall market.
 - If the beta is below 1, the stock either has lower volatility than the market, or it's a volatile asset whose price movements are not highly correlated with the overall market.
 - The price of Treasury bills (T-bills) has a beta lower than 1 because T-bills don't move in relation to the overall market.
- In the United States, stocks generally have a positive beta since they are correlated to the market.
- The S&P 500, Dow Jones Industrial Average, and Nasdaq 100 are frequently used beta measures.



Understanding the CAPM (continued)

- An investment project's (stock value of a Special Purpose Vehicle (SPV)) beta is then multiplied by the market risk premium, which is the return expected from the market above the risk-free rate.
- The risk-free rate is then added to the product of the investment project's beta and the market risk premium. The result should give investors the required return or discount rate they can use to find the value of an asset.



Understanding the CAPM (an example)

- Imagine an investor is contemplating a stock worth \$100 per share today that pays a 3% annual dividend. Assume:
 - The stock has a beta compared to the market of 1.3, which means it is riskier than a market portfolio.
 - The risk-free rate is 3% and this investor expects the market to rise in value by 8% per year.
- The expected return of the stock based on the CAPM formula is 9.5%:
 - $9.5\% = 3\% + 1.3 \times (8\% - 3\%)$.



Assumptions behind the CAPM formula that have been shown not to hold in reality

- Modern financial theory rests on two assumptions:
 - (1) Securities markets are very competitive and efficient (that is, relevant information about the companies is quickly and universally distributed and absorbed);
 - (2) These markets are dominated by rational, risk-averse investors, who seek to maximize satisfaction from returns on their investments.



Learning from CAPM

Despite its limitations, the CAPM formula is still widely used because it is *simple and allows for easy comparisons of investment alternatives*.

- The goal of the CAPM formula is to evaluate whether a(n) (SPV's) stock is fairly valued when its risk and the time value of money are compared to its *expected return*.
- The expected return of the CAPM formula is used to discount the expected dividends and capital appreciation of the SPV's stock over the expected holding period.
 - If the discounted value of those future cash flows is equal to \$100 then the CAPM formula indicates the stock is fairly valued relative to risk.



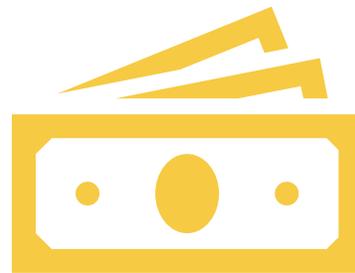
Beta Analysis – Index

- Including beta in the formula assumes that risk can be measured by a stock's price volatility:
 - However, price movements in both directions are not equally risky.
 - The look-back period to determine a stock's volatility is not standard because stock returns (and risk) are not normally distributed.
- The market portfolio that is used to find the market risk premium is only a theoretical value:
 - It is not an asset that can be purchased or invested in as an alternative to the stock.
 - Most of the time, investors will use a major stock index, like the S&P 500, to substitute for the market, which is an imperfect comparison.



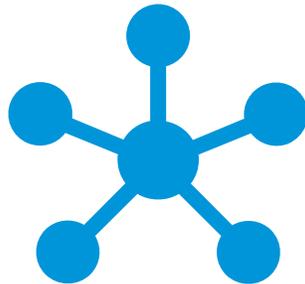
Beta Analysis – Time Periods

- Assumes that the risk-free rate will remain constant over the discounting period.
 - If (in the previous example) the interest rate on U.S. Treasury bonds rose to 5% or 6% during the 10-year holding period.
- An increase in the risk-free rate also increases the cost of the capital used in the investment and could make the stock look overvalued.



Assumptions behind the CAPM formula that have been shown not to hold in reality

- CAPM Relies on Assumptions about Investor Behaviors, Risk and Return Distributions, and Market Fundamentals that do not Match Reality
- The most serious critique of the CAPM is the assumption that future cash flows can be estimated for the discounting process. If an investor could estimate the future return of a investment (stock) with a high level of accuracy, the CAPM would not be necessary.



Discussion & Excel Spreadsheet Demonstration



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What Is Weighted Average Cost of Capital – WACC?

- The weighted average cost of capital (WACC) is a calculation of a project's (firm's) cost of capital in which each category of capital is proportionately weighted.
 - All sources of capital, including common stock, preferred stock, bonds, and any other long-term debt, are included in a WACC calculation.
- The WACC increases as the beta and rate of return on equity increase because an increase in WACC denotes a *decrease* in valuation and an *increase* in risk.



WACC Formula and Calculation

$$WACC = E/V * Re + D/V * Rd * (1-Tc)$$

Where:

Re = Cost of equity

Rd = Cost of debt

E = Market value of the firm's equity

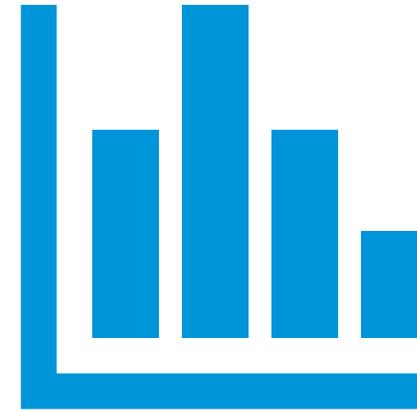
D = Market value of the firm's debt

V = E + D = Total market value of the firm's financing

E/V = Percentage of financing that is equity

D/V = Percentage of financing that is debt

Tc = Corporate tax rate



Calculating WACC

- To calculate WACC, multiply the cost of each capital component by its proportional weight. The sum of these results, in turn, is multiplied by 1 minus the corporate tax rate.
- Calculation of a project's (firm's) cost of capital in which each category of capital is proportionately weighted.
- Incorporates all sources of a capital—including common stock, preferred stock, bonds, and any other long-term debt.



Learning from WACC

- Debt and equity are the two components that constitute a project's/company's capital funding.
- Lenders and equity holders will expect to receive certain returns on the funds or capital they have provided.
- Since the cost of capital is the return that equity owners (or shareholders) and debt holders will expect:
 - WACC indicates the return that both kinds of stakeholders (equity owners and lenders) can expect to receive.

Put another way, WACC is an investor's opportunity cost of taking on the risk of investing money in a project/company.



Who Uses WACC?

- Analysts frequently use WACC when assessing the value of investments and when determining which ones to pursue.
 - In [discounted cash flow](#) (DCF) analysis, one may apply WACC as the discount rate for future cash flows in order to derive a business's net present value (NPV).
 - WACC may also be used as a hurdle rate against which companies and investors can gauge [return on invested capital](#) (ROIC) performance.
 - WACC is also essential in order to perform economic value-added (EVA) calculations.
- Investors may often use WACC as an indicator of whether or not an investment is worth pursuing.
 - WACC is the minimum acceptable rate of return at which a company yields returns for its investors.

To determine an investor's personal returns on an investment in a company, simply subtract the WACC from the company's returns percentage.



When the required rate of return is equal to the cost of capital, it sets the stage for a favorable scenario.

The **required rate of return** is the minimum return an investor will accept for owning a company's stock, as compensation for a given level of risk associated with holding the stock. ***Analysts use RRR to:***

Analyze the potential profitability of capital projects.

The **cost of capital** refers to the expected returns on securities issued by a company. Companies use the cost of capital metric to judge whether a project is worth the expenditure of resources. ***Investors use this metric to:***

Determine whether an investment is worth the risk compared to the return



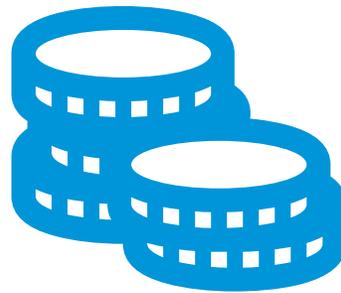
Limitations of WACC

- The WACC formula seems easier to calculate than it really is:
 - Because certain elements of the formula, like the cost of equity, are not consistent values, various parties may report them differently for different reasons.
- While WACC can often help lend valuable insight into a an investment/company, one should always use it along with other metrics when determining whether to invest in a project.



Iterations in WACC

- Beginning debt is based on the market value of debt and equity.
- The WACC discount rate needs *iteration* because the values of debt and equity in a project (or a privately held company) are not publicly known (not traded in the market).



Iterations in WACC (continued)

- Iteration demonstrates validity using an industry average capital structure.
 - Estimates the debt and equity structure and then subtracting the debt to arrive at the invested capital of the company.
 - Iterations are necessary as long as the market value and book value of the invested capital are not close.
 - If the invested capital is reasonably close to the book value, further iteration is not necessary.
 - Without this process, there will be errors in the conclusion of value.



Iterations in WACC (continued)

$$E_m = (NCF1)/(d-c) - Debt$$

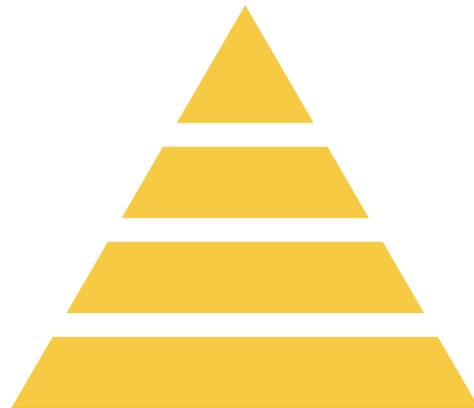
This is a constant growth capitalization model to estimate the market value of a project's equity when calculating WACC, where:

- E_m = market value of the project's equity,
- $NCF1$ = net cash flow projection in the first year following the project valuation
- d = the discount rate, estimated with this iterative process, and
- c = the average annual growth rate in the project's net cash flow.



Iterations in WACC

- If the WACC is not iterated when the changes in capital structure require it, the WACC will be incorrect and the value of the project (SPV/company) will be either over or under stated.



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Hard Currency vs. Local Currency

- **Hard currency** refers to money that is issued by a nation that is seen as politically and economically stable.
- **Hard currencies** are widely accepted around the world as a form of payment for goods and services and may be preferred over the **domestic currency**.
- **Local currencies** help to keep money within a *community*. They encourage the purchase of *locally* produced goods and services.
 - The greater the circulation within a **community**, the larger the economic benefit to those who live there.
 - *Local currencies* empower a *community* to maximize its use of productive resources.



Hard Currency vs. Local Currency (continued)

- A **sovereign bond** is a national government-issued debt security.
 - Its structure represents a debt owed to finance spending programs, cover interests due, or repay old debts.
 - As with other types of bonds, a *sovereign bond* promises to pay the buyer periodic interest and repay the face value on the maturity date.
- When a government needs money to fund its operations, it can raise cash by *issuing debt* in its own currency.

Countries may decide to **issue debt** in a foreign currency, thereby quelling investor fears of currency devaluation eroding their earnings.



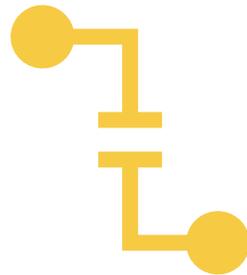
Sovereign Spread

- The *sovereign spread* represents the difference between [bond](#) yields issued on international markets by the country in question (Bangladesh) versus those offered by governments with AAA ratings.
- A *sovereign bond* is a specific [debt](#) instrument issued by the government. They *can* be denominated in both *foreign and domestic currency*. Just like other [bonds](#), these also promise to pay the buyer a certain amount of interest for a stipulated number of years and repay the face value on maturity.
- *Sovereign risk* is the chance that a national government's treasury or central bank will default on their [sovereign debt](#), or else implement foreign exchange rules or restrictions that will significantly reduce or negate the worth of its [forex](#) contracts.



Sovereign Spread (continued)

- Sovereign spreads can be broken up into two components:
 - The expected loss from default, and
 - The risk premium.
- The latter reflects how investors price the risk of unexpected losses



Sovereign Spread - Credit Ratings

- **AAA** (outstanding) is the highest possible **rating** is assigned to an issuer's bonds by any of the major **credit rating** agencies.
 - **AAA-rated** bonds have a high degree of creditworthiness - their issuers are easily able to meet financial commitments and have the lowest risk of default.
- While the three main ratings agencies – Standard & Poor's, Moody's and Fitch – are divided on the credit worthiness of numerous countries: unanimous that following are AAA rated:
 - Australia, Canada, Denmark, Germany, Luxembourg, Norway, Singapore, Sweden, and Switzerland.
- *Note:* U.S.A. is AA+ (excellent)



Factors Affecting Bangladesh's Credit Rating

- Bangladesh is projected to be the third fastest-growing nation this year and the next by major multilateral institutions.
 - Global credit rating agencies Standard and Poor's (S&P) and Moody's maintained their long-standing ratings of BB- and Ba3 respectively - stable outlook for Bangladesh's growth potential.
 - S&P maintained its long-held rating of BB- for Bangladesh, underscoring a stable outlook for the country while highlighting major fiscal constraints faced by the nation.



Bangladesh has a credit rating of BB+ (stable outlook)

- Bangladesh has limited fiscal flexibility:
 - Constrained revenue generation capacity,
 - High debt-servicing costs, and
 - Voluminous spending on infrastructure improvements.
- These setbacks are weighed against a strong external profile, arising from a:
 - Competitive garment export sector,
 - Large migrant remittances, and
 - Substantial engagement with donors.
- Low level of income offers a narrow base from which the government can collect revenue, severely limiting the country's fiscal and monetary flexibility acutely needed to immunize itself from exogenous shocks.
- However, Bangladesh's GDP per capita growth rate of 5.9% over the 2013-2022 period indicates strong real economic growth compared to other countries within similar income brackets.



Discussion



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Common Methods for Valuing Private Companies

- The Comparable Company Analysis (CCA) method operates under the assumption that similar firms in the same industry have similar multiples.
 - When the financial information of the private company is not publicly available, we search for companies that are similar to our target valuation and determine the value of the target firm using the comparable firms' multiples.
 - This is the most common private company valuation method.
- The Discounted Cash Flow (DCF) method takes the CCA method one-step further.
 - As with the CCA method, we estimate the target's discounted cash flow estimations, based on acquired financial information from its publicly-traded peers.
- The First Chicago Method is a combination of the CCA valuation method and the DCF method.
 - The distinct feature of this method lies in its consideration of various scenarios of the target firm's payoffs.
 - Usually, this method involves the construction of three scenarios: a best-case (as stated in the firm's business plan), a base-case (the most likely scenario), and a worst-case scenario.
 - A probability is assigned to each case.



The Comparable Company Analysis (CCA)

- To apply the CCA method
- Identify the target firm's characteristics in size, industry, operation, etc., and establish a “peer group” of companies that share similar characteristics.
- Collect the multiples of these companies and calculate the industry average.
 - While the choices of multiples can depend on the industry and growth stage of firms, the [EBITDA multiple](#) is one of the most commonly used multiples.
 - The [EBITDA](#) is a firm's net income adjusted for interest, taxes, depreciation, and amortization, and can be used as an approximate representation of said firm's free cash flow.



To apply the CCA method...

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 - The EBITDA is a firm's net income adjusted for interest, taxes, depreciation, and amortization, and can be used as an approximate representation of said firm's free cash flow.

The firm's valuation formula is expressed as follows:

Value of target firm = Multiple (M) x EBITDA of the target firm

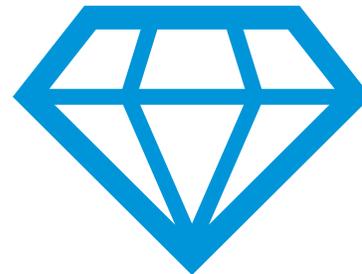
- Where, the Multiple (M) is the average of Enterprise Value/EBITDA of comparable firms, and the EBITDA of the target firm is typically projected for the next twelve months.



Private company valuation is primarily constructed from assumptions and estimations.

While taking the industry average on multiples and growth rates provides a decent guess for the true value of the target firm, it cannot account for extreme one-time events that affected the comparable public firm's value.

As such, we need to adjust for a more reliable rate, excluding the effects of such rare events.



Questions and Comments?



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CLDP's PPP Pre-Recorded Webinar Series

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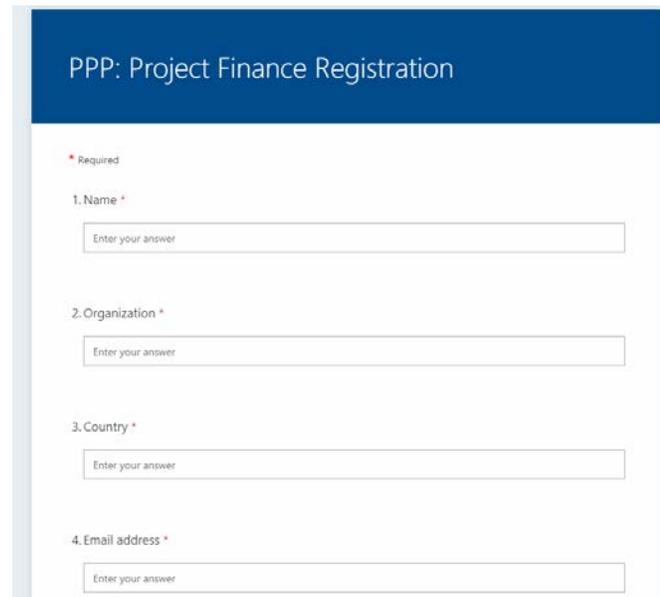
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Register

Watch



The screenshot shows the CLDP website's 'Public Private Partnerships (PPP) Series' page. The header includes the CLDP logo and navigation tabs for 'ABOUT CLDP', 'AREAS OF EXPERTISE', 'COUNTRIES & REGIONS', 'WHO WE SERVE', 'PROGRAMS', and 'RESOURCES'. The main content area features a 'Public Private Partnerships (PPP) Series' section with a 'View' button and an 'Introduction to the Webinar Series' section. Below this is a video player for 'The Commercial Law Development Program Presents Public-Private Partnership Webinar Series'. To the right, there is a 'Upcoming Programs' section listing 'PPP Series: Unsolicited Proposals' and 'CLDP in Action'.



The screenshot shows a registration form titled 'PPP: Project Finance Registration'. The form includes a search bar at the top and a list of required fields: '1. Name *', '2. Organization *', '3. Country *', and '4. Email address *'. Each field has a corresponding text input box.



The screenshot shows a YouTube video player for the webinar. The video title is 'PPP: Unsolicited Proposals'. The video player includes a search bar, a play button, and a progress bar showing 3:30 / 58:22. The video content displays 'Today's Agenda' with two bullet points: 'Lessons Learned From Global Survey of Unsolicited Proposals (USPs)' and 'Colorado's High Performance Transportation Enterprise's Experience with USPs'. The video player also shows 4 views and the date Sep 30, 2020.





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