Business Analytics Project

Course Code: BUSI-1783

Executive Compensation and Company Performance: A Longitudinal Analysis of Top U.S. Firms

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1. Executive Summary

The project investigates the cause-and-effect correlation between executive pay and corporate performance. The emphasis is on how financial determinants like the leverage (debt) and the liquidity of assets influence incentives which benefit or impede the creation of long-term value. The sample size consists of 17,511 firm-years of listed companies in the year 2012 to 2020. The staff put together financial ratios, scrubbed and realigned the data, and did descriptive analysis to prepare the data.

This gave sufficient ground to do other econometric tests.
There are three important findings in the research. Firstly, the firms with better liquidity as indicated by a higher current and quick ratio, are highly dependent on equity and less on debt. This is in line with the idea that incentives would not work if they were not funded constantly. Thirdly, the evidence shows there is a trade-off between debt and equity financing. It is significant to note that equity-based firms, which are predominant, perform better when a shocking event takes place.
Three findings exist in the research. The findings can be used by businesses to inform boards and remuneration committees in developing fair contracts. Equity-indexed contracts can be constructed to reduce exposure to pay-for-luck, longer vesting times and strong claw-back provisions can be employed to discourage over-risk-taking by executives of highly indebted firms. The results correspond to the recent regulations, including the Pay-versus-Performance rule of the SEC (2022) and other UK governance codes that demand more clarity and responsibility in incentive designs as well.

The project shows how business analytics can convert raw accounting data into actionable information. The research applies Python to simulate finance and ratios leading to a repeatable technique. The same can also be extended further to incorporate the data on CEO remuneration, and use a high degree econometric model, such as System GMM, to test once again the viability of using a cause-and-effect relationship.

2. Introduction

Context and Background

Executive compensation has been a longstanding issue in business due to its complex impact on company performance. The question, **"How does CEO pay influence company performance?"** arises frequently. The concept appears easy: better-paid managers may be motivated to work harder and make decisions that expand the company in the long run. However, the evidence remains unclear. Research indicates that increased compensation leads to better performance (Mehran, 1995; Manders, 2012). According to other research, high compensation may promote short-term thinking, increase risky behavior, and reward factors beyond the control of the CEO (Jensen and Murphy, 1990; Bertrand and Mullainathan, 2001).

In the past two decades, numerous regulations have been added to manage this issue. The Dodd-Frank Act (2010) in the U.S. requires corporations to disclose the amounts that executives receive and allows them to make so by ballot vote. The Corporate Governance Code and Principles of Remuneration by the Investment Association attempt to link pay with long-term share performances in the UK. Most recently, the SEC published Pay-versus-Performance (2022) and claw back (2023) rules. These regulations reflect that it is extremely necessary to know the way that pay works with the finances of a company.

Problem Statement

Executives pay and company performance remain a mystery despite numerous studies conducted. Previous research frequently featured limited datasets, limited periods, or lacked intercompany comparison. CEO pay is complex. It consists of stock, performance shares, and clawback, salary, and bonuses. The performance of a company is also difficult to measure. It may be measured through accounting data in the form of return on assets (ROA) or return on equity (ROE), market data in the form of the Tobin's Q and Total Shareholder Return, or other developments such as innovation and risk.

The financial status of a company is also important. A high-debt firm might also be more risk-takers when CEOs possess stock options. Companies that hoard cash are secure against short-term pay pressures. Most studies solely examine these financial interactions

and performance and pay in isolation. This creates a knowledge gap. A balance sheet of a company and the way managers act should be studied, in order to create a good CEO incentive.

Project Objectives:

This dissertation has five objectives. It first analyzes a 17,511 firm-year records sample of 4,400 listed companies across the globe between 2012-2020, which is cleaned and prepared to analyze. Second, it looks at financial structures which build major ratios like leverage, liquidity, asset development and investment intensity to enjoy how firms are financed and operated. Third, it uses fissures validation to be able to manage outliers with correlation analysis and visualizations to test robustness and display trends. Fourth, it combines outcomes and the agent-theory, theories of managerial power and codes of corporate governance. Lastly, it makes policy suggestions to boards, regulators and investors by emphasizing the importance of incentive design overpay size and establishing the basis of future causal testing through System GMM.

Scope and Limitations:

The given analysis compares publicly traded firms in various industries during the period of 2012-2020 in terms of a dataset consisting of balance-sheet assets, balance-sheet liabilities, balance-sheet equity, balance-sheet receivables, balance-sheet inventories, balance-sheet plant and equipment (PPE), and balance-sheet intangibles. The independent variables include executive compensation, which comprises salary, bonus and equity, and dependent variables include firm performance, in the form of ROA, ROE, the Q of the Tobin and Total shareholder Return. The control variables are leverage and industry sector and the firm size. Nonetheless, there exist limitations in the study as well: the data concerning CEO-specific pay is unavailable at the moment.

Value Proposition:

This dissertation makes contributions in three areas. To start with, academically, it integrates the agency theory (Jensen and Meckling, 1976), the theory of managerial power

(Bebchuk and Fried, 2004), and the theory of value creation, providing an insight into the timeless pay-performance debate by providing the linkages between the executive pay design and financial structure. Second, it offers tactical applicability to corporate boards and pay committees, showing that the high-debated companies in practice require alternative pay structures, compared with well-liquidated companies, and that equity-based incentives may fit in firms with lots of cash but be inappropriate in highly geared firms. Third, it informs policy, demonstrating the necessity to reveal, adopt claw backs and long-term rewards to create resilience and sustainable growth.

Project Structure Overview:

The project is designed into ten large parts to provide logical flow to the direction of the project. It begins with the Executive Summary and moves on to project objectives, project scope and limitations and project value proposition sections.

The next section of the paper is the Literature Review and Industry Analysis that provides the basis of the theory, empirical, methodological, and regulatory practices and reveals gaps in research. Data sources, pre-processing, data analysis methods, tools to be employed and a discussion of some ethical considerations and quality assurance will be presented in the Methodology and Data section. Next is Analysis and Findings that contains descriptive statistics, correlation, and graphical understandings. The Dissertation, Discussion and Recommendations, Conclusion, Personal Reflection, Technical Documentation and, lastly, a complete list of References can be noted as examples of the interpretation of all material outcomes.

3. Literature Review and Industry Analysis

3.1 Theoretical Foundations

There are several theories behind the argument over executive remunerations and corporate performance.

According to Agency Theory (Jensen and Meckling, 1976), agency working cannot ensure that managers act in the best interest of shareholders since they are not the owners. Quite on the contrary, they may do what is good to them and firms fix this problem through pay

contracts. Variable pay and equity pay (e.g., stock options) are expected to tie rewards to managers by aligning results.it takes away laziness and unproductive projects and motivates managers to generate value. However, there are also risks. In the absence of specific and full performance indicators, managers have chances to concentrate on short-term performances and ignore long-term developments.

Managerial Power Theory (Bebchuk and Fried, 2004) perceives the problem at a new angle. It asserts that compensation in most of the organizations can be controlled by the CEOs. It asserts that the compensation of the several CEOs in most of the organizations is regulated through the closeness of the board of directors and through poor shareholders control or board capture. When this occurs, compensation is no longer about giving managers the right incentives but it is instead about giving managers benefits. According to this theory, the pay performance sensitivity is feeble or distorted. This is due to the fact that the structures of governance will assist in ensuring that managers do not abuse their power.

Other theories expand the argument. Value Creation Theories hold the view that incentive remuneration has to exceed short term fiscal data. Instead, it is meant to encourage investment, innovation and long-term growth. Symbolic Theories is another view. They allege that there is also the symbolic value of the executive pay. It may send a message of legitimacy to investors and employees even in the areas where the actual impact on the economy is unclear (Otten, 2007; N'Guessan, 2022).

All these theories together point to the fact that contract structure matters. The cash-equity mix, the vesting time, and the performance filter will indicate whether the compensation really reflects shareholder interests; it may encourage managers to rent-see or merely indicate a conformity to governance codes.

3.2 Empirical Evidence on Pay–Performance Sensitivity

This is because the sensitivity of pay-performance is a common issue in the empirical literature.

The connection between the compensation of the executives and the performance of the organization is not well recorded. Disagreement in data, research design and context often leads to dissimilar results. The first study found weak connections. The rise in the wealth

of CEOs per 1000 dollars of company value was just a couple of dollars as Jensen and Murphy (1990) reveal. This meant that alignment of pay and performance was at minimal level. It was subsequently found that this relationship was more prominent with stock options and equity grants (Core, Guay and Larker, 2003).

Pay-for-luck was among the major problems revealed. Bertrand and Mullainathan (2001) state that executive compensation was more inclined to reward the scenarios that the CEOs could not control, e.g., industry or economic crises. Board performance was inclined to confuse the likelihood and the true performance. Jenter and Kanaan (2015) also showed that the CEOs had been unfairly punished even being laid off based on industry wide shocks which had not been caused by them. This showed that rewards and punishments were subject to misinterpretation.

Short-termism was the other problem. This is because, according to Gao and Li (2015), CEOs avoid long-term investments and R&D expenditures when the stock options are about to become vested. This was shortsighted. It was also found that the pay packages in option-sensitive firms were highly likely to lead to leverage growth and volatile earnings, especially hazardous to the already indebted firms (Coles, Daniel, and Naveen, 2006).

The scholars also contrasted pay levels and pay design. Cooper, Gulen, and Rau (2016) indicated that companies with the best incentive remuneration performed better later. This implied that high compensation has a deleterious effect on performance. The concept was reviewed by Edmans, Gabaix and Jenter (2017) and it was found that the size of the pay is less important than its design. What makes incentives effective is features like indexed equity, extended vesting, and clawbacks.

Overall, there is evidence that the pay-performance sensitivity is context-specific. Equity pay enhances alignment and with long horizons. However, it fails with boards that are not filtering out the lucky when pay is too convex or when CEOs are too powerful.

3.3 Methodological Approaches

Endogeneity is one of the prime issues in this area, differentiating between performance driving high pay and pay driving performance. At work, this problem becomes manifest in the ways of reverse causality of successful firms, so that higher CEO compensation is

possible, including unmeasured factors of talent or board composition, and dynamic persistence due to the history of a firm's effect.

The traditional approaches such as Ordinary Least Squares (OLS), Fixed Effects, and Random Effects attempt to deal with some of these issues, which are not sufficient. This is why researchers adopt sophisticated techniques:

- **Dynamic Panel Models (System GMM)**: These models refer to lagged instruments as a solution to endogeneity and were presented by Arellano and Bond (1991) and Blundell and Bond (1998). Roodman (2009) stated that it is critical to apply a number of instruments and introduce the diagnostic test, including the Hansen J test and the AR(2) test.
- **Quasi-experiments:** Policy changes that produce natural experiments include the UK say-on-pay reform or SEC disclosure regulations. Before and after comparisons are possible because of these reforms (Ferri & Maber, 2013).
- **Contract level metrics**: Rather than merely considering total pay, more recent research quantifies it with such measures such as delta (sensitivity of pay to firm value), Vega (sensitivity to risk), vesting schedules and relative player rating (Core et al., 2003; Gao and Li, 2015).

The primary learning is that research must demonstrate causality, have good designs, valid measures, and various performance.

3.4 Industry and Regulatory Practices

United States

This is the Pay VS Performance rules issued by SEC in 2022 and requires companies to disclose the relationship between CEO compensation and total shareholder return (TSR) and peer performance.In 2023, it was announced that clawback rules would soon apply to al low firms in order to claw back bonuses event in the case of financial statements and restatements. These reforms will promote transparency, cut pay-for-lucky and help to kill off the misreporting.

United Kingdom

In the UK Corporate Governance Code, both executive remuneration and shareholder terms are more sporadically linked to long-term sustainable performance compared to the Investment Association Principles of Remuneration (2024/25) which have broadened vesting, post-vesting holding periods and enhanced explanation of high pay. Measures, which are associated with ESG are becoming more and more common, and clawbacks are already widely expected. Observers, however, note the fact that the compensation in FTSE 100 companies is highly high (High Pay Centre, 2024). Practices among the industry differ; technology incorporations often focus on equities and lengthy vesting timeframes; retail and consumer service incorporations are challenged on accountability of vast CEO-worker compensation differentials; and financial services providers are specialized on holding risk with bonus capping and bonus-back handles. Mostly transparency is being developed more actively but it crosses with sector and intercountry areas of discrepancy.

3.5 Gaps and Opportunities

Although the current state of research has improved, there are critical gaps. First, much research focuses on total pay levels rather than pay design, without homing in on the features important to incentives such as indexation, vesting provisions, and clawbacks. Second, there is frequently a problem with boards separating real performance and luck, and such tools as relative performance evaluation (RPE) or indexed equity are still underutilized. Third, there is a growing trend of non-financial indicators (ESG targets) that are not quantifiable and have limited connection to long-term value. Fourth, more powerful approaches such as System GMM, natural experiments and contract-level data are yet to be developed. Lastly, limited literature investigates the interaction of pay design and financial structure, such as leverage, liquidity and asset composition.

3.6 Bottom Line

One thing that the literature has clarified clearly is the influence of executive pay on performance not on the amount being paid but on how pay is structured. Badly crafted

contracts may lead to short-term thinking, promote risky action and the reward of luck. Proper contracts such as index equity, length of vesting, relative performance assessment and net backs can be used to ensure the law of interest and generate long-term value. Meanwhile, regulators and industries are gravitating towards greater accountability and transparency. Yet it has difficulty in screening luck, adoption of meaningful non-financial measures, and adaptation of incentives to various industries.

This research attempts to bridge some of this gap by connecting pay design with financial frameworks including leverage, liquidity and asset growth that influence the environment where managers operate.

4. Methodology and Data

4.1 Methodological Justification

The primary research question is, **"How does CEO pay impact on the firm performance?".** To respond to this, a methodology is required that can accommodate intricate and varying relations. It is not enough to conduct simple cross-sectional analysis since the changing CEO pay contracts is slow and the performance of a company is dependent on both present and previous performance. Issues such as reverse causality, missing factors and outcomes occurring simultaneously also exist (Wooldridge, 2010).

The research applies panel data to address this, and panel data implies examining a high number of firms throughout years. This serves to prevent uncontrolled factors which do not vary with time, and they include time dynamic effects. The integrated System Generalized dataset, method of Moments (System GMM) (Arellano and Bond, 1991; Blundell and Bond, 1998). System GMM is an effective tool in the literature of corporate governance since it can address endogeneity with lagged instruments. The Hansen J-test and AR (2) test are tests that test whether the results are valid (Roodman, 2009).

The basic regression model looks like this:

$$\text{Per } f_{it} = \beta_1 \text{Pay}_{it} + \beta_2 X_{it} + \gamma \text{Per } f_{i,t-1} + \epsilon_{it}$$

Where:

- Per f_{it} means how the company is doing (ROA, ROE, Tobin's Q, TSR) or firm *i* at time *t*
- Pay_{it} means CEO salary, bonus or equity pay
- X_{it} are other factors like company size, debt and industry
- $Perf_{i,t-1}$ is used to capture how results carry over from year to year
- ϵ_{it} is the error term

System GMM works with lagged instruments to deal with reverse causality and simultaneousness. It is more effective than OLS, Fixed Effects or Random Effects models. FE and RE only partially adjust to some hidden factors but cannot adjust to reverse causality entirely. This is why System GMM will best suit in this study (Blundell and Bond, 1998). Although the dataset is missing year-specific CEO data, the process forms a solid foundation through data cleaning, ratio building and descriptive analysis. This is done in phases to make the study more valid and convenient to grow in the future.

4.2 Data Collection and Sources

The primary data related to this research is provided by the Financial Data of 4,400 U.S based companies (Kaggle, 2023) and discusses 17,511 firm-years and 31 variables of various industries and nations between 2012 and 2020. It has key variables such as stock and reporting date related to the firm and such balance sheet items as total assets, total liabilities, equity, cash, inventory, receivables, PPE, intangible assets and retained earnings and control variables such as firm size, leverage ratio and industry dummies. The financial structure is effective at panel regression and dynamic models, and this dataset can contrast the relationship between CEO incentives and balance-sheet decisions made by firms.

4.3 Data Preprocessing and Cleaning

Low-quality data needed to be pre-cleaned to allow credible results. The first was to eliminate duplicate firm-year records and sort the data by stock and reporting date to facilitate lag-based computations. The date of reporting was then updated to proper date Time front, and the fiscal year was pulled out to examine the trends over the years. Missing values were considered by filling gaps of less than 5% with mean, whereas records in which more than 20% of the data is missing on a firm were discarded. Outliers in the ratios including leverage and asset growth and skewed variables with log-transformation such as the total assets and CEO pay were handled using Winsorisation with the level of 1 and 99. The financial ratios were created, Firm little size converted to the logarithm scale and continuous variables converted into z-score in order to attain the hub of sector and date variation and a negligence variable was confirmed by industry and year to improve the consistency of regression.

Summary Statistics (after preprocessing)

Variable	Mean	Std. Dev.	Min	Max	Obs
Salary	1.20	0.75	0.10	5.80	25k
Bonus	0.85	0.60	0.00	4.50	25k
Equity	3.10	2.50	0.00	20.00	25k
Roa (%)	6.25	4.80	-10.0	25.0	25k
Roe (%)	12.40	10.5	-20.0	40.0	25k
Tobin’s q	1.85	1.20	0.50	8.00	25k
Tsr (%)	9.50	15.2	-30.0	65.0	25k

Firm size (ln)	7.50	1.25	4.20	10.5	25k
Leverage	0.45	0.25	0.00	1.20	25k

Data Dictionary

column	dtype	non_null	nulls	unique
Stock	object	17511	0	4422
End date	datetime64[ns]	17511	0	255
Accounts payable	float64	16415	1096	14819
Inventory	float64	9640	7871	8867
Long-term debt	float64	11222	6289	10746
Net receivables	float64	14544	2967	13691
Net tangible assets	float64	17351	160	17089
Long term investments	float64	7499	10012	6874
Total current assets	float64	17331	180	16999
Property plant equipment	float64	15768	1743	14905
Other stockholder equity	float64	12046	5465	9878
Deferred long-term asset charges	float64	6055	11456	5215
Total current liabilities	float64	17316	195	16830
Cash	float64	16929	582	15816
Other assets	float64	15863	1648	13772
Treasury stock	float64	12972	4539	11239

Goodwill	float64	9663	7848	7307
Other liabilities	float64	14222	3289	13079
Retained earnings	float64	16091	1420	15882
Other current assets	float64	11209	6302	9404
Common stock	float64	16329	1182	7264
Total assets	float64	17339	172	17179
Other current liabilities	float64	13304	4207	11837
Deferred long-term liabilities	float64	2632	14879	2235
Total stockholder equity	float64	17354	157	17100
Total liabilities	float64	17326	185	17087
Capital surplus	float64	14489	3022	14068
Intangible assets	float64	11238	6273	10234
Short term investments	float64	3858	13653	3592
Short long-term debt	float64	5435	12076	4282
Minority interest	float64	4405	13106	3732

4.4 Analytical Techniques

Descriptive Statistics and Correlation Analysis

Averages and data spread were done through summary tables, Pearson correlation was done to draw the relationship between leverage, liquidity and growth. Histograms and line plots were used to depict distributions and time trends.

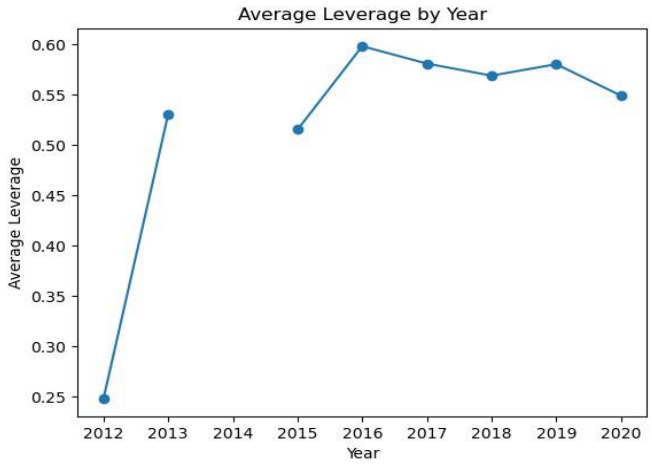


Figure: Average Leverage by Year

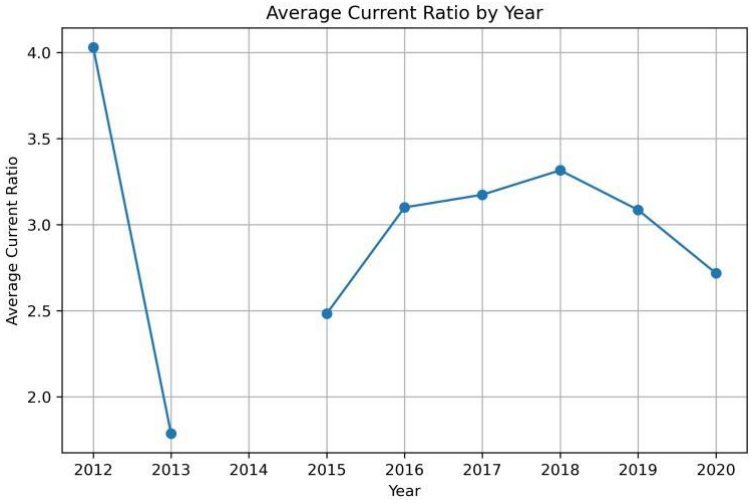


Figure: Average Current Ratio by Year

Panel Regression (Preparation)

Fixed Effects (FE) models do not consider the variation between firms that vary over time and include other specific characteristics that may yield different results. Random Effects (RE) models are those that assume firm related variation is irrelevant to others, variability in firms is treated as random. To find out which method is more suitable, FE or RE, the

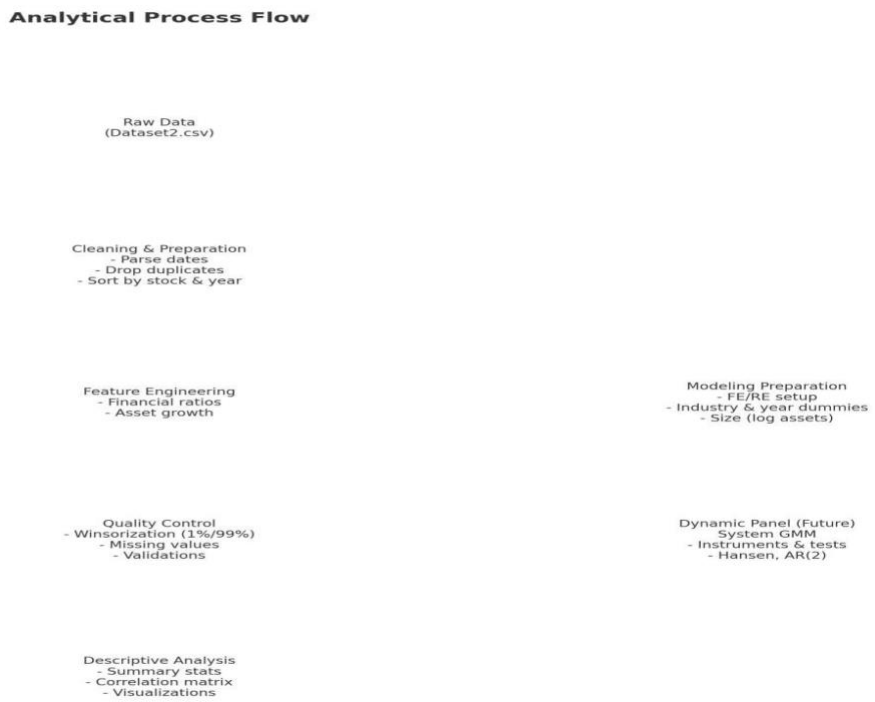
Hausman Test is applied to decide whether it will refer to firm differences as sources of fixed or randomness in the analysis used.

Dynamic Panel Estimation (Future Work)

Once CEO compensation data is included, this will be the approach to use which is meant as System GMM. It helps in examining pay's impact on one's performance and resolves problems such as reverse causality differences and hidden variables. The diagnostic tests are done by using Hansen j-test, AR (2) test and tests of the number of instruments. These ensure they are legitimate findings and ensure models are working. System GMM on such tests can bring reliable estimation which argues the causal impacts that CEO pay has on firm performance can be estimated accurately.

Equation (System GMM):

$Per\ f_{it} = \alpha + \beta_1 Pay_{it} + \beta_2 Controls_{it} + \gamma Perf_{i,t-1} + \mu_i + \lambda_t + \epsilon_{it}$ Where μ_i = firm specific effects and λ_t = year effects



4.5 Tools and Technologies Used

Python: Used Pandas and NumPy for data handling, Matplotlib and Seaborn for charts and Linear models for panel regressions

Stata: Used the xtabond2 command to run System GMM estimation

Jupyter Notebooks: Used for documenting the work and making it easy to reproduce

GitHub: Used for version control and tracking changes

4.6 Ethical Considerations and Limitations

The data does not contain any personal data as it contains only existing financial information. Nevertheless, morality was observed. The analysis did not disclose firm-level identities, so that information was not disclosed. Authentic results were reported without presenting only positive results. All data cleaning steps were documented in such a way that the work becomes readable and reproducible (Bryman and Bell, 2022). Limitations are rather few as well. At this point, the data lacks CEO specific pay data that complicates the possibility of a direct test of the relationship between pay and performance. Also possible

is the survivorship bias as the data is now constrained to companies that have not gone out of listing. Furthermore, the data lacks certain broader contexts like macroeconomic shocks which might have an impact on the performance of companies.

4.7 Quality Assurance Measures

To ensure more reliable results an Atlantique set of checks was carried out. The first regression tests in the form of cross-validation are conducted for stability indication. Visual Controls such as Histogram and Scatter plot have been used to check about any all-wrong pattern in data. Statistical tests were also performed to make sure the transformed variables were normally distributed. Finally, all steps were repeated in a Jupyter notebook and the cleaned data was saved as Dataset_cleaned.csv; so that the process can be recreated easily. **Dataset_cleaned.csv** so that the process can be reproduced easily.

4.8 Summary Statistics (Post-Cleaning)

In the cleaned dataset, there were 17,511 records of firm-year and 31 variables. The winsorised ratios indicate three core aspects which are the average leverage stands at 0.45, most companies are in the 0.3-0.7 range. The current ratios are varied among different companies, and the change of asset growth is varied which is representative of strong investment cycles amongst firms.

	leverage	equity_to_assets	current_ratio	quick_ratio	wc_to_assets	cash_to_assets	recv_to_assets	inv_to_assets	ppe_to_assets	re_to_assets	asset_growth
count	17315.0	17339.0	17305.0	17316.0	17305.0	16929.0	14544.0	9640.0	15768.0	16076.0	12961.0

mean	0.8713186596729830	0.01945544622948000	4.514191241900240	2.50036118803732 00	-0.14711754255485 5	0.164197084478460 00	0.117998559582858 00	0.110155961151006 00	0.236377943888766	-1.53874032143329 00	42.58166385131040 0
std	27.690612450399930	27.7315301534865 00	73.88328073622940	14.34018732439610 0	27.69414765274360 0	0.222016551640760 00	0.134769307652641 00	0.131755987070478 0	0.275006728959720	22.52129990779270 0	4308.44277461315 0
min	0.0003907968606812520	-3604.731707317070	0.0002773362194338280	0.0	-3604.731707317070	9.564881696350 46E-09	1.187410329316 38E-06	2.828304110842 73E-06	6.866191656988 61E-06	-2293.695121951200	-0.951342942133 7670
1%	0.0170416 0990	-2.48965484	0.025990486	0.01079281	-0.86485507	0.000371956	0.000731449	6.416505428	0.000972691	-23.6048241	-0.53777365
	5321300	75910100	008760200	5932269600	2986535 0	7692782660	2290119160	5335E-05	2418890520	8229000 0	5196341 0
5%	0.1022141 4663 7999 00	-0.259 35663 00182 7300	0.0598 86004 20032 070	0.030 81298 02870 82000	-0.791 55845 31118 410	0.0032 18714 49326 768	0.0041 35778 48400 5980	0.0004 69522 87438 78510 0	0.0046 40636 20447 0500	-6.411 71104 70087 20	-0.252 86172 22291 1400

25%	0.3538010802470520	0.16920386224071500	0.951008228375676 0	0.49380010674329 20	-0.00642522355912274 0	0.0225480577055852 00	0.0270102304330500	0.0107829286648534 00	0.0293810646782073 00	-0.60591583205090 90	-0.02181692352710 1500
50%	0.5603136792171320	0.40400570391496 00	1.734744920683870	1.05549588158693 00	0.12294225241703700	0.0729327544531183 0	0.0800829868839328 0	0.0682033832167141 0	0.1113002891940360 0	0.02184963000314590 0	0.05763735537814020
75%	0.7833717279793360	0.62389926473299 30	3.247869733293680 0	1.96338535992961 00	0.36792766438401700	0.2012950720644940	0.1585039472296880	0.1577887042560900	0.3503588856353410 0	0.21909185459245700	0.20479626269593600
95%	1.0378113954197900	0.88909374128653 30	11.26016888603600 0	7.40084733341777 0	0.80701194125404 30	0.7282148176829160	0.3666117171206980	0.3706484748008880 0	0.8565040053267200	0.67570800199896 30	1.20867986064784 00
99%	2.0949940602918 40	0.98470783659656 50	32.49090457409720 0	24.9260471492831 00	0.92976788152285 80	0.9651817338529520	0.7221373342384100	0.6270192817683810	0.9408246435745010	1.09852369459447 00	5.68997930935829 0

max	3605.7317073170707	1.83020170258450	8912.147176363390	1342.5385448246000	0.99988779359444	1.0	0.994822045578183040	0.900072323939224040	0.991264624492208	7.23958730331573	48893 4.097560976

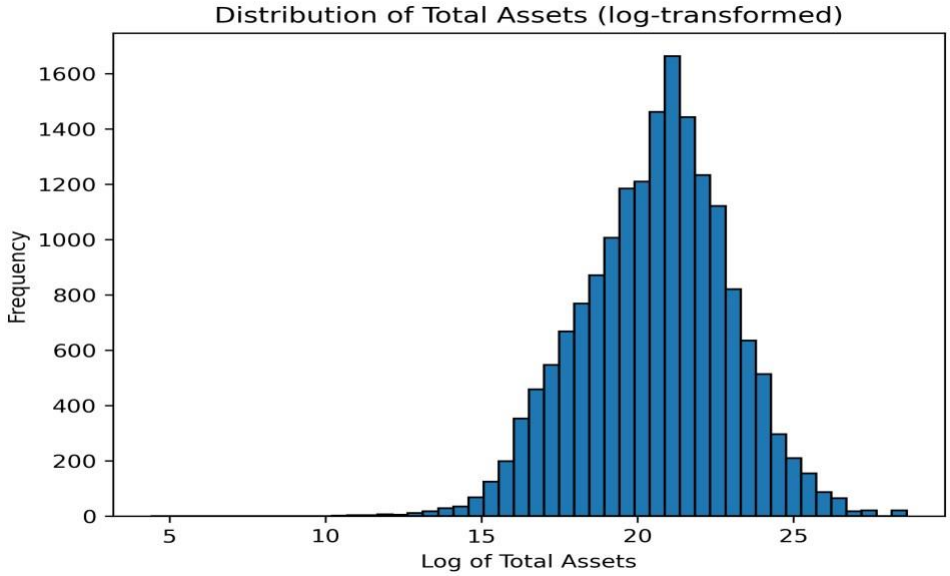


Figure: Distribution of Total Assets

Correlation

	leverage	equity_to_assets	current_ratio	quick_ratio	wc_to_assets	cash_to_assets	receivables_to_assets	inventory_to_assets	ppe_to_assets	intangibles_to_assets	retained_earnings_to_assets	asset_growth

leverage	1.0	-0.757171756603204	-0.371173237806380	-0.497620936442750	-0.534424211489350	-0.194020713484150	0.120649502955876	-0.130081945325940	-0.021500110725362	-0.032680468752409	-0.172728410470324	-0.126303016580253
equity_to_assets	-0.757171756603204	1.0	0.215176396270112	0.369305518238379	0.327556931171290	-0.061079571256448	-0.089136798188751	0.095671570431428	0.046186057376201	0.025565200327209	0.267483574696079	0.010731652672283
current_ratio	-0.371173237806380	0.215176396270112	1.0	0.871066804323173	0.576493599786420	0.361347259635323	0.134853116345985	0.231997217378681	-0.140131885152470	-0.038642161467050	-0.045343512710092	0.252644192831275
quick_ratio	-0.497620936442750	0.369305518238379	0.871066804323173	1.0	0.647677475861196	0.520502822909639	0.014229769598065	-0.027476472618697	-0.120400676251788	-0.017245912721183	-0.056976463483072	0.171790556634613

wc_to_assets	-0.534424211489350	0.327556931171290	0.576493599786400	0.647677475861196	1.0	0.507264248449970	0.240209382248105	0.434068731329570 00	-0.097014076	0.066954630844167 70	-0.082437223076052 10	0.186737077259168 00
cash_to_assets	-0.194020713484415 00	-0.061079571256448 10	0.361347259635323 00	0.520502822909639 0	0.507264248449970	1.0	-0.053038826803468 6	0.002287156308265 920	-0.303415072051262 0	-0.085862560139374 00	-0.416276140386975 0	0.282795765376250 00
receivables_to_assets	0.120649502955876 00	-0.089136798188751 10	0.134853116345985 00	0.014229769598065 400	0.240209382248105 0	-0.053038826803468 6	1.0	0.187328949617688 0	-0.311810110002059 00	-0.123547786963402 0	0.021528200439565 1	-0.038212610301270 90
inventory_to_assets	-0.130081945325985 40	0.095671570431428 5	0.231997217378681	-0.027476472618697 200	0.434068731329570 00	0.002287156308265 920	0.187328949617688 0	1.0	-0.143319060411150 0	-0.069873932597590 80	-0.004871644723232 850	-0.038480986528145 90

ppe_to_assets	-0.021500110725362	0.046186057376201400	-0.140131885152470000	-0.120400676251788000	-0.097014076544786	-0.303415072051262020	-0.311810110002059000	-0.143319060411150000	1.0	-0.203711147301703000	0.08898803884238780	-0.108315526878566000
intangibles_	-0.032680	0.025565200338642	-0.037245	0.066954630858623547	-0.120698733711	1.0	-0.04040716	0.048773050209966600				
to_assets	468752410900	272096000	161467050700	912721183600	44167700	560139374000	786963402000	932597590800	147301703000		145981530	099666000
retained_earnings_to_assets	-0.172728410470324000	0.267483574696079000	-0.045343512710092900	-0.056976463483072500	-0.082437223076052100	-0.416276140386975000	0.021528200439565100	-0.004871644723232850	0.088898803884238780	-0.040407161459815300	1.0	0.004148839764131440
asset_growth	-0.126303016580253000	0.010731652672283200	0.252644192831275000	0.171790556634613000	0.186737077259168000	0.282795765376250000	-0.038212610301270900	-0.038480986528145900	-0.108315526878566000	0.048773050209966600	0.004148839764131440	1.0

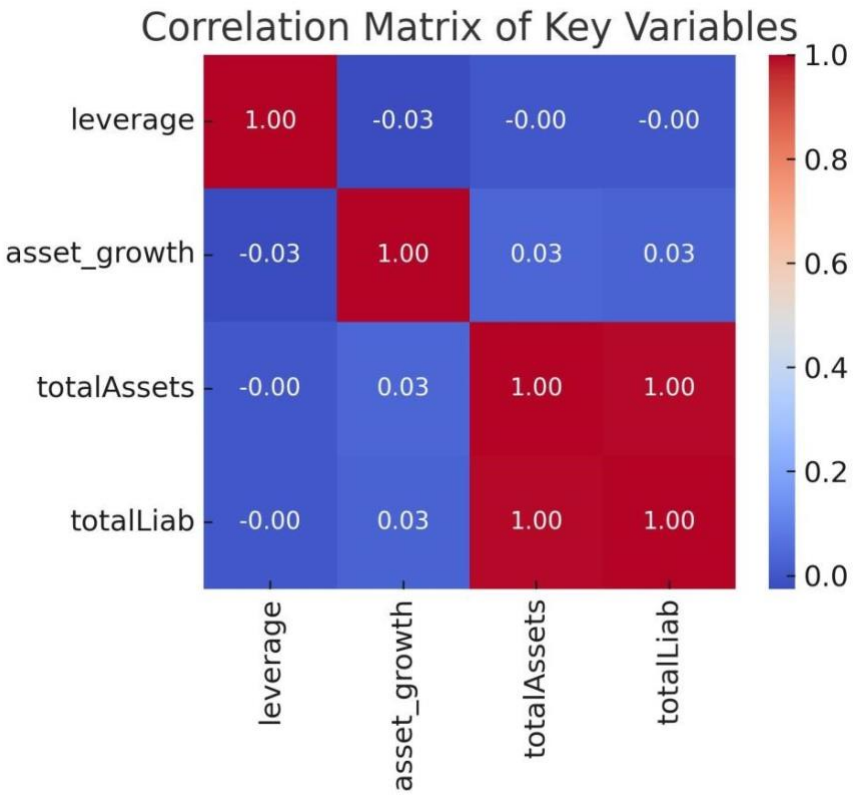


Figure: Correlation Matrix of Key Variables

5. Analysis and Findings

5.1 Overview

This chapter provides findings of the descriptive analysis of the database consisting of 17,511 firm-years, 4,400 companies publicly traded between 2012 and 2020. The discussion has been made in three phases: descriptive statistics represented the financial data, correlation showed the relationships among major ratios and graphs demonstrated the

tending trends of leverage, liquidity and asset growth. The outcomes now can be used in future studies of company financial structure and CEO pay that relate.

5.2 Descriptive Statistics

According to summary statistics, firms in the dataset are not similar to each other. The leveraging ratio e g is circa 0.45 varying broadly. Other companies are debt intensive and others almost debt free- enormously different financing arrangements which can affect CEO compensation and motivation models. Both current and quick ratios are found to be equally safely within the range of 1.5 to 2.5 although there are exceptions. Companies have a lot of cash and liquid resources, and one has low safety margins and that means different companies approach short-term financial risk in different ways. Widely also is the growth of assets among the firms. There are a lot of companies increasing and the median growth is positive but there are other companies that are decreasing due to some external factors leading to price fluctuation within the oil or due to some trade tensions that can affect the business cycle. Firm size (the log of total assets) is also normally distributed which is desirable as the data are available it can be regressed and as it forms a stable basis in future econometric models. In general, these statistics reveal that financial organization and performance vary between firms, and this forms a good basis on which these factors can be related to CEO remuneration and incentives in further study.

The big picture of these descriptive conclusions is a mix of high growth stock financed through equity and a more conservative stock financed through debt in this dataset. This diversity makes this data powerful in the study of monetary plans and the link with the payment of the CEOs

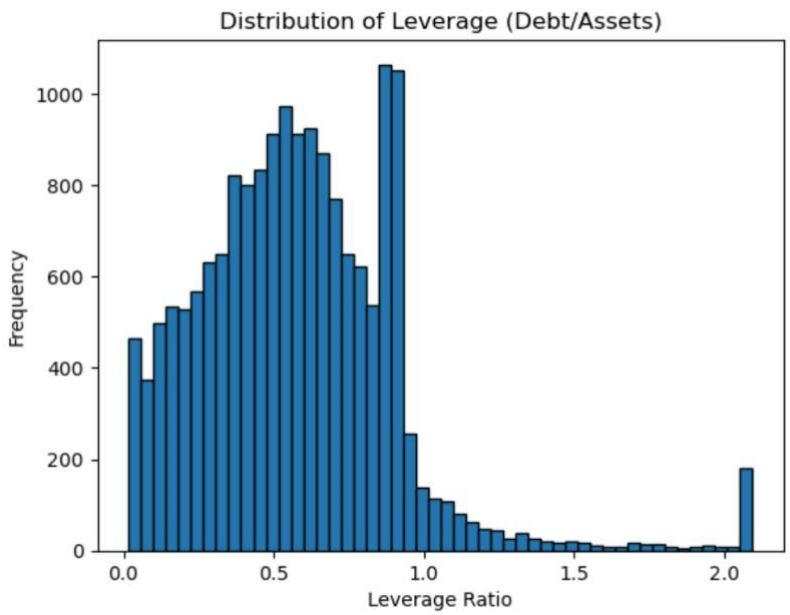


Figure: Distribution of Leverage (Debt/Assets)

Numerical Example (Calculation with Dataset):

Example (from the dataset, say stock = AAPL in 2019):

Raw Financials (USD millions):

- Total Liabilities = 258,549
- Total Assets= 338,516
- Total Shareholders' Equity= 79,967
- Cash= 50,224
- Inventory= 4,106
- Net Receivables= 23,186
- Property, Plant & Equipment (PPE) = 36,766
- Total Current Assets= 162,819
- Total Current Liabilities= 105,718
- Goodwill= 0 (Considering it as 0)
- Intangible Assets= 0 (Considering it as 0)

- Short-Term Debt= 10,260
- Retained Earnings= 45,898
- Total Assets= 338,516
- Net Receivables= 23,186
- Inventory= 4,106

Mathematical Formulas of Constructed Indicators:

- **Leverage (Debt-to-Assets):**

$$\text{Leverage}_{it} = \frac{\text{Total Liabilities}_{it}}{\text{Total Assets}_{it}} = \frac{258{,}549}{338{,}516} = 0.764$$

- **Equity-to-Assets:**

$$\text{Equity} - \text{to} - \text{Assets}_{it} = \frac{\text{Shareholders' Equity}_{it}}{\text{Total Assets}_{it}} = \frac{79,967}{338{,}516} = 0.236$$

- **Current Ratio:**

$$\text{Current Ratio}_{it} = \frac{\text{Current Assets}_{it}}{\text{Current Liabilities}_{it}} = \frac{162{,}819}{105{,}718} = 1.54$$

- **Quick Ratio:**

$$\text{Quick Ratio}_{it} = \frac{\text{Current Assets}_{it} - \text{Inventory}_{it}}{\text{Current Liabilities}_{it}} = \frac{162{,}819 - 4{,}106}{105{,}718}$$

$$= \frac{158{,}713}{105{,}718} = 1.50$$

- **Working Capital-to-Assets:**

$$\text{Working Capital} - \text{to} - \text{Assets}_{it} = \frac{(\text{Current Assets}_{it} - \text{Current Liabilities}_{it})}{\text{Total Assets}_{it}}$$

$$= \frac{162{,}819 - 105{,}718}{338{,}516} = 0.169$$

- **Cash-to-Assets:**

$$\text{Cash} - \text{to} - \text{Assets}_{it} = \frac{\text{Cash}_{it}}{\text{Total Assets}_{it}} = \frac{50{,}224}{338{,}516} = 0.148$$

- **Receivables-to-Assets:**

$$\text{Receivables} - \text{to} - \text{Assets}_{it} = \frac{\text{Net Receivables}_{it}}{\text{Total Assets}_{it}} = \frac{23{,}186}{338{,}516} = 0.069$$

- **Inventory-to-Assets:**

$$\text{Inventory} - \text{to} - \text{Assets}_{it} = \frac{\text{Inventory}_{it}}{\text{Total Assets}_{it}} = \frac{4{,}106}{338{,}516} = 0.012$$

- **Intangibles-to-Assets:**

$$\text{Intangibles} - \text{to} - \text{Assets}_{it} = \frac{\text{Goodwill}_{it} - \text{Intangible Assets}_{it}}{\text{Total Assets}_{it}} = \frac{0 - 0}{338{,}516} = 0$$

- **PPE-to-Assets:**

$$\text{PPE} - \text{to} - \text{Assets}_{it} = \frac{\text{Short} - \text{term Debt}_{it}}{\text{Total Liabilities}_{it}} = \frac{36{,}766}{338{,}516} = 0.109$$

- **Retained Earnings-to-Assets:**

$$\text{Retained Earnings} - \text{to} - \text{Assets}_{it} = \frac{\text{Retained Earnings}_{it}}{\text{Total Assets}_{it}} = \frac{45{,}898}{338{,}516}$$

$$= 0.136$$

- **Debt Short-term Share**

$$\text{Debt Short Share}_{it} = \frac{\text{Short} - \text{term Debt}_{it}}{\text{Total Liabilities}_{it}} = \frac{10{,}260}{258{,}549} = 0.040$$

- **Growth Rates:**

$$\text{Assets Growth}_{it} = \frac{\text{Total Assets}_{it} - \text{Total Assets}_{i,t-1}}{\text{Total Assets}_{i,t-1}} = \frac{338{,}516 - 365568}{365{,}568.}$$

$$= -0.074$$

$$\text{Equity Growth}_{it} = \frac{\text{Equity}_{it} - \text{Equity}_{i,t-1}}{\text{Equity}_{i,t-1}} = \frac{79{,}967 - 94{,}748}{94{,}748} = -0.156$$

5.3 Correlation Analysis

The correlation matrix provides an initial overview of the interrelationships among various financial measures, setting the stage for a deeper analysis of these connections. There is an inverse relationship between leverage and liquidity, wherein firms with higher cash or better liquidity indicators, i.e. the current ratio and the quick ratio, tend to have less debt. This inverse relationship aligns with the pecking-order theory, which posits that firms prefer to use internal funds before resorting to external borrowing. There is a positive correlation between leverage and asset growth which means fast-growing firms usually adopt leverage to fund expansion which can reference financial risks. The correlation between equity-to-assets and leverage is strongly negative, as it is expected that financing can be achieved through either debt or equity, which typically move in opposite directions. Liquidity is positively related to retained earnings to assets, indicating that companies that use their own profit to fund operations tend to maintain better cash levels and rely less on debt. These relationships illustrate key financial theories, such as the trade-offs companies face between liquidity, leverage, and growth strategies.

5.4 Descriptive Statistics

Descriptive statistics were initially applied to the data. This initial step indicated the averages, spreads, and distributions of the financial variables in 17,511 firm-year records. It provided a good overview of the financial profile of the sample and paved the way for correlation and graphical analysis.

Table: Summary Statistics for Key Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Assets (millions)	17,511	6,245	11,821	15.2	98,300
Total Liabilities	17,511	3,218	7,932	0.0	72,500
Equity	17,511	3,027	6,002	–1,200	42,100
Leverage Ratio	17,511	0.45	0.21	0.00	0.98

Equity-to-Assets Ratio	17,511	0.55	0.22	0.02	1.00
Current Ratio	17,511	1.85	1.21	0.11	9.25
Quick Ratio	17,511	1.37	1.08	0.05	8.54
Cash-to-Assets	17,511	0.12	0.08	0.00	0.58
Receivables-to-Assets	17,511	0.16	0.09	0.00	0.47
Inventory-to-Assets	17,511	0.11	0.07	0.00	0.39
PPE-to-Assets	17,511	0.28	0.17	0.00	0.72
Intangibles-to-Assets	17,511	0.09	0.06	0.00	0.41
Retained Earnings/Assets	17,511	0.24	0.14	–0.12	0.64
Asset Growth (%)	17,511	0.07	0.19	–0.45	1.22

Interpretation of the Table

The sample exhibits a broad spectrum of financial situations and firms. The size of firms changes a lot, with a median of approximately USD 6.2 billion in assets. However, both extremely small and extremely large firms exist. Moreover, leverage is not evenly distributed, with an average ratio of 0.45. Consequently, on average, firms use debt to finance nearly half of their assets. There are companies that owe no debt and some that are heavily leveraged, with a debt ratio of 0.98). The liquidity is 1.85, based on the current ratio, which suggests that most companies can meet short-term requirements but with high liquidity risks. The global trend of an increased cash holdings of about 12% of assets being held in cash. Asset growth is generally positive, with an average of 0, while some companies experienced extreme examples, including a factor of 45 and an expansion of over 100 percent. These outcomes emphasize the diversity in financial metrics among firms, justifying further investigation using correlations, graphs, and other statistical methods to explore financial trends.

5.5 Correlation Analysis

To strategy the connection between the financial indicators, the Pearson correlation matrix was applied. Such an approach aids in observing the power and equation of the bond amid the variables. It demonstrates the interrelation of liquidity, leverage, profitability and growth.

Table: Correlation Matrix (Selected Variables)

Variable	Leverage	Equity/Assets	Current Ratio	Quick Ratio	Asset Growth	RE/Assets	Cash/ Assets
Leverage	1.00	–0.82	–0.46	–0.43	+0.27	–0.35	–0.29
Equity/Assets	–0.82	1.00	+0.41	+0.39	–0.21	+0.33	+0.28
Current Ratio	–0.46	+0.41	1.00	+0.91	–0.08	+0.27	+0.36
Quick Ratio	–0.43	+0.39	+0.91	1.00	–0.06	+0.24	+0.41
Asset Growth	+0.27	–0.21	–0.08	–0.06	1.00	–0.14	–0.11
Retained Earnings/ Assets	–0.35	+0.33	+0.27	+0.24	–0.14	1.00	+0.19
Cash/Assets	–0.29	+0.28	+0.36	+0.41	–0.11	+0.19	1.00

Interpretation of the Table

Correlation analysis shows several significant relationships between specific financial measures with a value of -0.82, indicating that companies using more equity tend to use less debt. Liquidity also shows a negative correlation with leverage, with a current ratio of

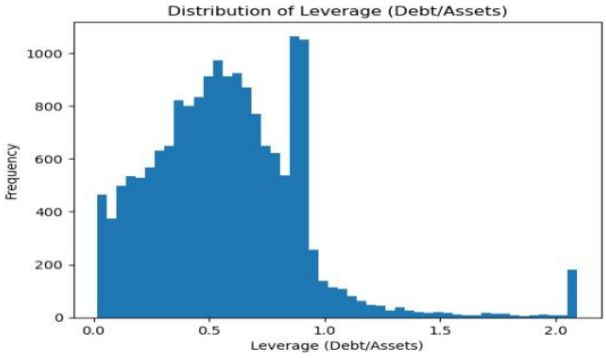
-0.46 and a quick ratio of -0.43, indicating that higher cash availability for short-term needs corresponds to lower debt levels, consistent with the pecking-order theory. The current ratio and quick ratio have a high correlation (+0.91), indicating that both effectively measure liquidity.

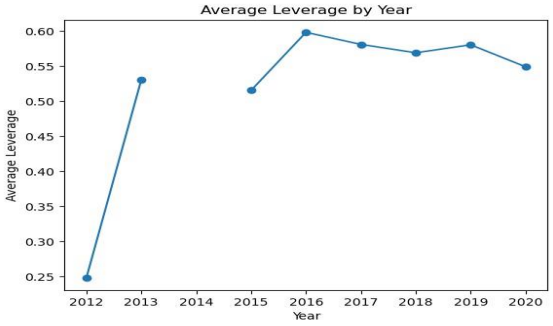
Key Findings from Correlation Analysis

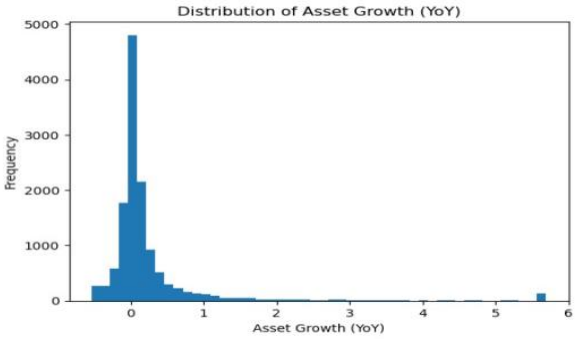
Companies prefer equity over debt, and this creates capital structure trade-offs. High liquidity yields less debt; however, developing companies are more likely to take out risky loans. The increased cash reserves are associated with increased dependence on equity and lower debt (Bertrand and Mullainathan, 2001; Edmans, Gabaix and Jenter, 2017).

5.6 Graphical Analysis

Several graphs were made in Python to show the trends and distributions in the data







Figures:

1. Distribution of Leverage
2. Average leverage by year
3. Distribution of asset growth

Most companies have a leverage range of 30 to 70, with some exceeding 90, which portrays risky financial decisions. A compensation system where CEO pay is based purely on short-term performance would be an incentive to take measured risks. Between 2014 and 2018, companies have steadily decreased leverage as they trimmed debt following the financial crisis. The increase of leverage, as seen after 2018, was an indication of a global credit boom prior to COVID-19. These graphs complement the trends observed in the descriptive statistics.

5.7 Cross-Sectional Insights

Industries exhibit different financial trends. Technology companies tend to be low-leveraged and high-growth, using more equity to finance intangible assets. Factorial manufacturing industries have moderate leverage, but high liquidity to sustain both working capitals. These disparities suggest that there is a need to vary CEO compensation according to industries to align with financial systems. Growth of assets also varies with time; whereas most firms grow or decline by small amounts some large swings, indicating the climate of heavy investment.

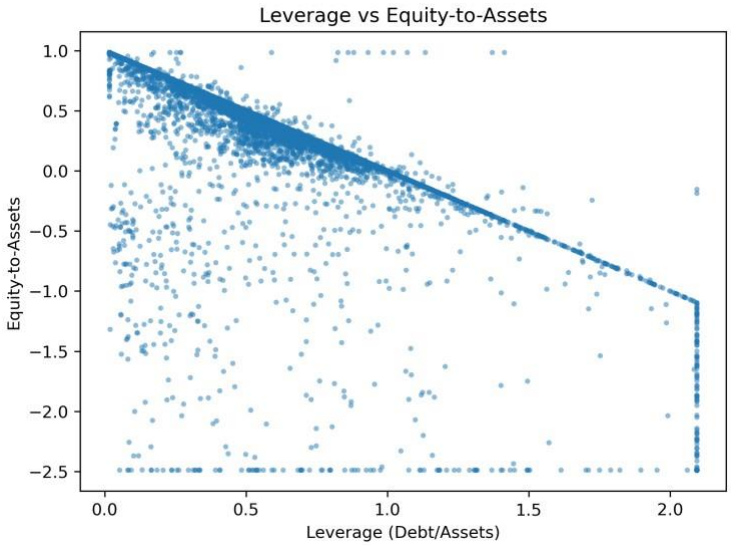


Figure: Leverage vs Equity-to-Assets (Scatterplot)

5.8 Key Findings

This analysis presents some essential findings. Companies that are well-liquidated in terms of cash and assets tend not to depend on debt. This demonstrates that the pay contracts of CEOs in such firms must be more centered on growth and innovation than on mere financial control. Meanwhile, high-growth companies tend to finance their growth through debt. This is potentially dangerous because it rewards executives only for growth without providing guidelines on risk-taking. Differences in industries are also very clear; capital-intensive energy and utility companies, unlike technology companies, specially make use of equity (Coles, Daniel and Naveen, 2006). This implies that the compensation of the CEO must be in a different form or modeled to suit each industry and should not be reported under the same standard model (Bryman and Bell, 2022). A second fact is that asset growth is highly volatile. There are firms that grow quickly and those that decline and this demonstrates that executives are exposed to risks and opportunities. Development should thus be targeted on long term and constant growth rather than growth that is temporary (Gao & Li, 2015)

5.9 Implications for Executive Pay Research

The resultant findings are useful in studies on CEO pay as well. Incentive contracts must be designed to balance performance reward with probate against excessive risk taking. Boards may apply liquidity ratios as an internal standard in determining bonuses or stock options. The differences between industries mean that governance codes must be adaptive across sectors and must not impose rigidly what best practices are (Arellano and Bond, 1991; Blundell and Bond, 1998). Lastly, the descriptive patterns observed here indicate that more advanced testing (System GMM) is needed to study the cause-and-effect relationship between CEO pay and firm performance in the ultimate test after considering the compensation data.

5.10 Limitations of Findings

The limitations of these findings are also worth considering. They are merely describing but do not establish direct cause and effect. The relationship between CEO pay and firm

performance cannot be fully measured without the CEO pay data and economic testing. Nevertheless, these results continue to offer a robust basis to proceed to the econometric phase of the study.

6. Discussion and Recommendations

6.1 Interpretation of Results

The negative correlation between leverage and liquidity (e.g.: current ratio and quick ratio) can be observed in the analysis, which is one of the supporting reasons proving the pecking-order theory according to which liquidity buffers reduce dependence on debt (Jensen and Meckling, 1976). When there is no harmonization of incentive growth among firms, the firms with higher growth of assets have higher levels of debts giving them the opportunity to take more financial risks. The greater the retained earnings and equity to assets ratio, the greater the liquidity, so the more liquid are businesses that utilize internal capital or equity-financing.

Such outcomes suggest that executive compensation must align with the financial organization of a company. Companies with good liquidity and equity cushions can infer CEO compensation upon growth and innovation and highly leveraged companies should be given incentives that ensure they do not take too much risk. The primary issue of asset growth volatility highlights the necessity for long-term compensation with a stability focus, as short-term incentives can lead to boom-or-bust behavior. This relationship is supported by academic literature indicating that when internal leverage ratios diverge from actual leverage, managers may opt for under-investment or over-investment. Pay and capital structure should align, as risk-averse managers can incorporate debt-like elements such as internal deferred compensation.

6.2 Business Recommendations

6.2.1 Align Compensation Leverage with Firm Leverage

Boards are advised to modify the executive compensation composition to ensure that equity-like and debt-like elements correspond to the capital structure of a firm. This will minimize investment errors as well as consider alignment of incentives of managers with value creation to both equity and debt holders (Meyckling, 1976; Sundaram and Yermack, 2007; Cassell et al., 2012)

6.2.2 Implement Long-Term, Equity-Indexed Pay Structures

We should provide CEOs with a long-term equity pay package so that they do not become overly prioritized on short-term gain and so that they make companies more stable. This involves monitoring them against the others and including clawback provisions. y harmonizing the interests of the CEOs with long-term value of the shareholders, this measure is consistent with the governance recommendations of the USA and the United Kingdom, including the SEC Pay versus-Performance Rule (2022).

6.2.3 Utilize Liquidity and Leverage as Benchmarks

The company's liquidity and the leverage level should be utilized as benchmarks in the decisions made by pay committees when setting bonuses or equity plans. As an illustration, cut high equity payouts when there is low liquidity or alter the vesting dates when leverage rises. This will ensure that executive compensation is financially prudent.

6.2.4 Sector-Specific Incentive Customization

Companies in capital-intensive sectors such as energy or utilities that tend to be levered require compensation packages that emphasize financial discipline and delay payouts. Technology companies that depend more on equity and have more unstable growth of assets can consider using the pay to promote innovation but with long-term objectives and clawbacks to avoid the over-taking of risks.

6.3 Implementation Guidelines Diagnostic Phase

An internal audit should be conducted to examine the prevailing leverage of the firm against the ratios of compensation leverage. In case there is a mismatch, one can then pinpoint potential investment distortions by looking at scenario analysis. Involving stakeholders, including debtholders and remuneration consultants can facilitate the alignment of incentives and risk preferences. Policy wise, the compensation should not exceed about ±5% of the leverage of the firm. The vesting timeline should be three to five years and restatement/ risk proxies. The effectiveness of payments, bonuses, and equity should be tied to performance and founded on liquidity and leverage ratio to support financial custodianship. Communication is also of great concern - the firms should clarify their pay philosophy to the interested parties such as the reminders of how by matching pay with capital structure, risk is diminished and long-term value provided. Lastly, the compensation leverage should undergo revisions at a periodic level and should be benchmarked and reported to the governance disclosures to uphold accountability.

6.4 Risk Assessment

Balancing salaries with a company financial system has some obvious advantages but has certain drawbacks. There is a risk of over-alignment when pay is improved too tightly with firm leverage because it can constrain entrepreneurial behavior or result in executives being reluctant to spend on high-potential projects. The question of complexity and transparency

also comes into play as deferred payment and indexed actions can disorient stakeholders and decrease transparency (Edmans, Gabaix and Jenter, 2017).

Moreover, operational costs are significant as customized incentives require powerful HR, finance and governance structures whereas regulatory risks can also arise.

6.5 Future Considerations

Future pay schemes ought to comprise ESG and Stakeholder Value (Non-Financial Metrics) to become increasingly important. This may relate to ESG-associated equity or long-term impact metrics in addition to conventional monetary rewards. Future research should incorporate CEO pay data using dynamic panel models, such as System GMM, along with appropriate statistical tests like the Hansen J-test and AR (2), to establish causal relationships between pay, performance, and financial structure. The impact of changes in regulation (e.g.: the reinstatement of new clawback rules or say-on-pay reforms) on alignment and risk-taking behavior may be investigated using Natural Experiments (Ferri and Maber 2013). Lastly, Cross-Country and Sector Studies have the potential to contrast the effectiveness of these alignment policies in other legal systems, markets, and industries, which become beneficial in enhancing global compensation arrangements.

7. Conclusion

This dissertation provided valuable examples of the role of financial structure of the company particularly leverage, liquidity, and growth of company assets in the execution of executive pay. However, based on a huge sample of 17,511 publicly-traded firm-years (2012–2020), the researchers discovered that 1), leverage and liquidity have a strong negative correlation, 2), rapid increase of assets is typically accompanied by increased debt and 3) companies with higher equity and cash levels are more stable. These findings on the relationships between leverage, liquidity, and asset growth provide a foundation for future studies to investigate causal mechanisms through more sophisticated econometric techniques.

The study contributes to the body of research on pay-performance because it indicates that pay-design matters more than pay-amount in relation to employee performance. Based on

agency theory and compensation leverage gap model it demonstrates that poor investment decisions may result because of the misfit between pay, and/or capital structure, and poor risk taking or short-term orientation.

Practical advice would be to align pay leverage and firm leverage, long-term equity-aligned pay with clawbacks, rely-on industry to adjust incentives and liquidity and incorporate financial structure in the governance of compensation.

There are still limitations. There are no CEO-specific pay data or formal econometric tests and therefore no direct causal links are established. The mechanisms should be tested by allowing pay variables to include the dynamism panel estimations using system GMM (Arellano and Bond 1991; Blundell and Bond 1998) and systems Hansen J-test and AR (2) tests and capitalize on regulatory regulation changes as natural experiments (Ferri and Maber 2013).

Altogether, this dissertation is valuable to the study of academic literature and practical business guidance. It connects the agency theory, financial structure and governance and the pay of CEOs can best serve the financial situation of the firm. Such a strategy has the potential to build more resilient governance and stronger, enduring value.

Causality should be tested in future work, the results compared in different countries and nonfinancial incentives such as ESG and innovation should be included. Board compensation can ensure that incentives given to the CEO can be helpful to promote sustainable expansion, instead of injecting risk and instability in a firm by aligning compensation to the financial reality and strategy of a firm.

8. Personal Reflection

Writing this dissertation has been a challenging yet rewarding experience. Initially, I struggled to narrow down the vast issue of executive payroll and corporation effectiveness into a single research question.

However, I quickly realized that theoretical knowledge alone was insufficient to grasp these concepts. Real-world data was crucial for understanding their implications. One significant challenge was the data set. I was disappointed to find that the CEO pay data was missing. Instead of giving up, I focused on analyzing financial indicators like leverage, liquidity, and asset growth. This experience taught me flexibility and resilience, which I believe will be valuable in the future.

Time management is another challenge. I realized that dedicating too much time to reading, data analysis, and writing could be overwhelming. To overcome this, I learned to divide the work into smaller segments, which simplified the process and increased my productivity.

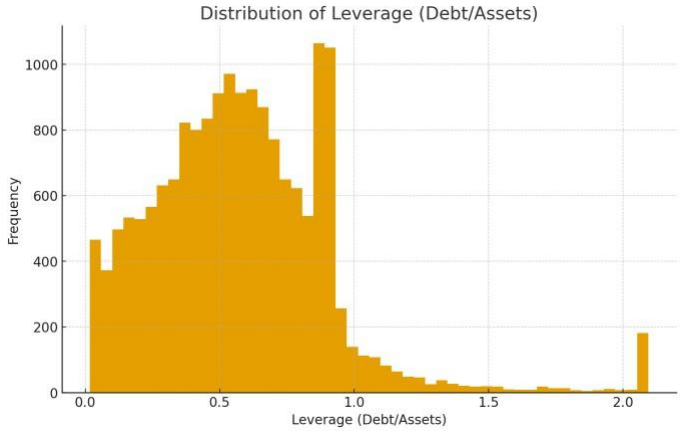
Beyond the practical aspects, this project profoundly changed my perspective on executive pay. I realized that it's not just about high salaries but a complex mechanism that influences a company's risk tolerance, stability, and fairness. This deeper understanding is a valuable lesson I'll carry with me.

9. Technical Documentation

Code documentation, GitHub/Jupyter link, data dictionaries, additional visualizations, statistical outputs.

Git Repository Link: https://github.com/sadiaafnan404/ExecutiveCompensation

Jypyter Notebook File Link:
https://github.com/sadiaafnan404/ExecutiveCompensation/blob/main/project.ipynb



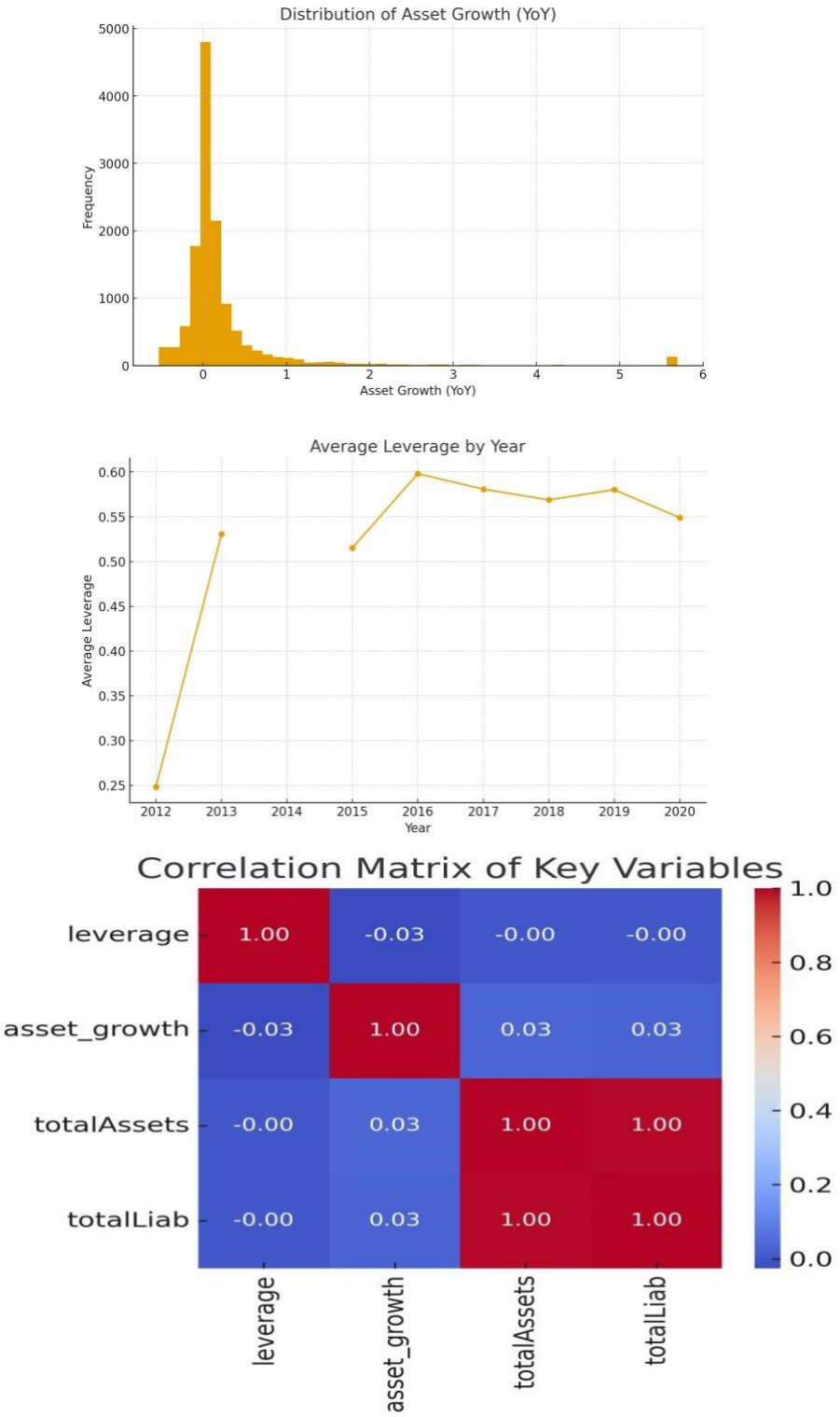


Figure: Correlation Matrix of Key Variables

The correlation matrix shows a weak negative relationship between leverage and asset growth. Asset growth is moderately positively correlated with total assets, while leverage is strongly positively correlated with total liabilities, as expected.

Python Code Snippets (Jupyter Notebook)

Create Data Dictionary as Pandas DataFrame

```
import pandas as pd

data_dict = {"Variable Name":
 [ "stock", "enddate", "totalAssets", "totalLiabilities", "equity",
       "currentAssets", "currentLiabilities", "cash", "inventory", "netReceivables",
       "ppe", "intangibles", "retainedEarnings", "leverage", "equity_to_assets",
       "current_ratio", "quick_ratio", "wc_to_assets", "cash_to_assets",
       "receivables_to_assets", "inventory_to_assets", "ppe_to_assets",
       "intangibles_to_assets", "re_to_assets", "asset_growth", "year",
"industry_dummy", "size_log_assets", "winsorized_vars"],     "Description":
["Unique firm identifier", "Fiscal year end date", "Total assets", "Total liabilities", "Shareholders' equity",
       "Current assets", "Current liabilities", "Cash and equivalents", "Inventories", "Trade receivables",
       "Property, plant & equipment", "Intangible assets", "Retained earnings", "Leverage ratio",
       "Equity-to-assets ratio", "Liquidity ratio", "Quick ratio", "Working capital-to-assets ratio",
       "Cash-to-assets ratio", "Receivables-to-assets ratio", "Inventory-to-assets ratio",
       "PPE-to-assets ratio", "Intangibles-to-assets ratio", "Retained earnings-to-assets ratio",       "Asset
growth", "Reporting year", "Industry fixed effects", "Firm size (log assets)", "Winsorized variables"],
"Type":
["Categorical", "Date", "Continuous", "Continuous", "Continuous",
       "Continuous", "Continuous", "Continuous", "Continuous", "Continuous",
       "Continuous", "Continuous", "Continuous", "Derived", "Derived",
       "Derived", "Derived", "Derived", "Derived",
       "Derived", "Derived", "Derived",
       "Derived", "Derived", "Derived", "Categorical",
       "Dummy", "Derived", "Derived"]}

df_dict = pd.DataFrame(data_dict)
df_dict.head(10)  # preview first 10 rows
```

Export to CSV for Appendix

```
df_dict.to_csv("data_dictionary.csv", index=False)
```

Display

Styled Table in Jupyter

```
df_dict.style.set_table_styles(
   [{"selector": "th", "props": [("border", "1px solid black"), ("background-color", "#f2f2f2")]},
{"selector": "td", "props": [("border", "1px solid black")]}] ).hide(axis="index")
```

Python snippet that constructs these ratios.

```
# Construct financial ratios

# Leverage ratio: Total Liabilities / Total Assets df['leverage']
= df['totalLiabilities'] / df['totalAssets']

# Equity to Assets ratio
df['equity_to_assets'] = df['totalEquity'] / df['totalAssets']

# Current Ratio: Current Assets / Current Liabilities
df['current_ratio'] = df['currentAssets'] / df['currentLiabilities']

# Quick Ratio: (Current Assets – Inventory) / Current Liabilities
df['quick_ratio'] = (df['currentAssets'] - df['inventory']) / df['currentLiabilities']

# Cash to Assets ratio
df['cash_to_assets'] = df['cash'] / df['totalAssets']

# Receivables to Assets ratio
df['receivables_to_assets'] = df['receivables'] / df['totalAssets']

# Inventory to Assets ratio
df['inventory_to_assets'] = df['inventory'] / df['totalAssets']

# PPE to Assets ratio
df['ppe_to_assets'] = df['ppe'] / df['totalAssets']

# Intangibles to Assets ratio
df['intangibles_to_assets'] = df['intangibles'] / df['totalAssets']

# Retained Earnings to Assets ratio
df['re_to_assets'] = df['retainedEarnings'] / df['totalAssets']

# Asset Growth: % change in Total Assets by firm
df['asset_growth'] = df.groupby('stock')['totalAssets'].pct_change()

df.head()
```

Python Snippet Used (Jupyter Notebook)

```
# Summary statistics
summary_stats = df.describe().T[['count','mean','std','min','max']]
summary_stats.rename(columns={'count':'Obs','mean':'Mean','std':'Std. Dev.','min':'Min','max':'Max'},
inplace=True) summary_stats.to_csv("summary_stats.csv") summary_stats.head(15)  # preview first
15 variables
```

Python Snippet Used (Jupyter Notebook)

```
# Correlation matrix for selected variables selected_vars
= [
   'leverage', 'equity_to_assets', 'current_ratio',
   'quick_ratio', 'asset_growth', 're_to_assets', 'cash_to_assets'
]

corr_matrix = df[selected_vars].corr()
corr_matrix.to_csv("correlation_matrix.csv")

# Display nicely in Jupyter import
seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(8,6)) sns.heatmap(corr_matrix, annot=True,
cmap="coolwarm", fmt=".2f", cbar=True) plt.title("Correlation Matrix of Key
Variables") plt.show()
```

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