DOI: https://doi.org/10.61841/cf0qth29 Publication URL: https://jarm-s.com/MS/index.php/MS/article/view/64

FURTHER INTELLIGENCE ON CLOSED-END FUNDS

Joel Viera-Pedroza

University of Puerto Rico, Graduate School of Business Administration

Corresponding Author:
joel.viera1@upr.edu

To cite this Article:
Viera, J. (2025). Further intelligence on closed-end funds. Journal of Advance Research in Mathematics And Statistics (ISSN 2208-2409), 12(1), 1-9. https://doi.org/10.61841/cf0qth29

ABSTRACT

This study shows inflation has distinct short and long-term effects on closed-end funds (CEFs) liquidity. With an inverse relationship between the prime rate and liquidity, CEFs use leverage. According to Datar (2001), an inverse relationship between liquidity and CEFs' discounts is expected. As robustness check, this study estimates the risk-free rate using the capital asset pricing model (CAPM). A validated rate strongly supports the existence of these relations, adding intelligence about CEFs discounts and liquidity.

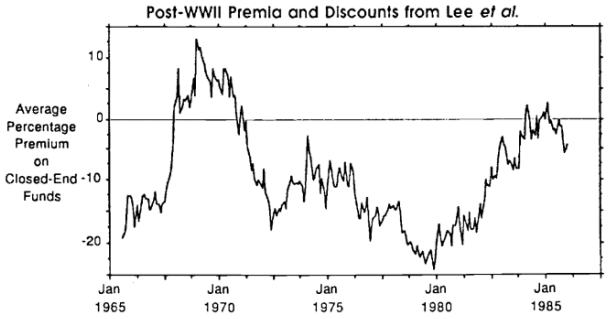
KEYWORDS: liquidity, inflation, leverage, discount, equity, CAPM
JEL Codes: G11, G12, G23

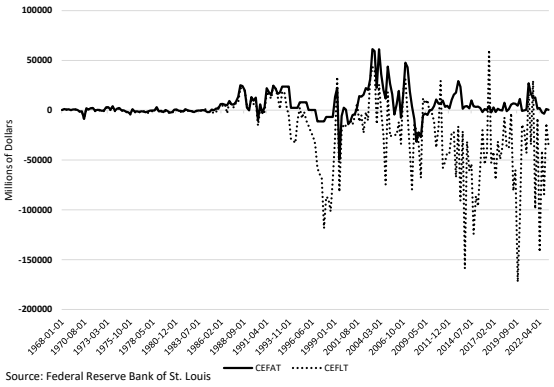
INTRODUCTION

Financial economics require fundamentals to measure abnormal outlays. Corporate investment decisions affect asset pricing. For Modigliani and Miller (1961), if earnings have "the same" value as dividends, then "earnings not paid out in dividends are retained" (Phillips and Ritchie, 1983). Most research on CEFs' "puzzle" also disregards their compliance as regulated investment companies. In Anderson and Born (1992, 2002), to hold its "tax-exempt status", a CEF may retain less than ten (10) percent "of its net income". Capital gains must be distributed completely through dividends. Whenever capital appreciation is recognized, distributions of gains increase, then taxes payable increase. Malkiel (1977) assumes that, after several years (and distributions), an investor puts shares (at discount) to then minimize income taxes paid.[1] Whether managed or not, on issuance, CEFs need to sell at premium due to managing or organizational costs, respectively (De Long and Shleifer, 1990). According to Benveniste and Spindt (1989), it "must be set low" to induce demand.

A CEF's share price is independent of its NAV until liquidated, then its expected value is NAV. However, this kind of stable NAV can be overvalued with illiquid assets to deal with increasing liabilities. Among other factors, transaction or liquidation costs reduce price (Burch, Emery and Fuerst, 2003). For Schonfeld and Kerwin (1993), CEFs are "often traded at discount from NAV". According to Pratt (1966), without sales forces nor marketability, there is a lack of public understanding about CEFs.

CEFs shares outstanding are fixed and nonredeemable (Schonfeld and Kerwin, 1993). With the irrelevance theorem, this is trivial. How CEFs must recognize capital appreciations escapes the scope of this study. But, when a CEF's underlying securities' prices decrease, do assets in its balance sheet also decrease? Do liabilities increase? Are inflation swaps in there? What about restricted (or borrowed) stocks? With certainty, NAV is affected by equity. However, discounts prevail whenever liquidity issues arise.





Given these figures, after Lee et al. study, during the 1990s, the trend on CEFs' liabilities transactions started to decrease. For Cherkes (2012), Lee et al. study those "survivors from the 1929 period". From year 1986 to 2000, "538 CEFs were issued", managing "$165 Billion". In 2000, the average discount was –10.14 percent, and seven (7) CEFs were liquidated. As seen (Table 1), more than a hundred CEFs were international and global.[2]

Table 1: Overview of the CEF Market, United States, 1998

Fund type	Fund category	Number of companies	Sector value ($bn)
Equity	Domestic	40	22
funds	International & Global	93	29
	All equity funds	**133**	**51**
Bond	Domestic	343	87
funds	International & Global	27	11
	All bond funds	**370**	**98**

Source: Dimson and Minio (1999)

Although most CEFs researchers avoid Federal Reserve Economic Data (FRED); in the balance of payments, financial accounts (FAs) record transactions balances, or flows of financial assets and liabilities between residents and non-residents. In general, an increase in assets (called) and a decrease in liabilities (paid) are recorded as debits; meanwhile, a decrease in assets (shorted) and an increase in liabilities (debt) are recorded as credits (Samuelson and Nordhaus, 2010). A net creditor (lender) has a positive balance, and a net debtor (borrower) has a negative balance in its FA.

According to Gresham's law, new financing transmits unfavorable asymmetric information and inflation. The consumer price index (CPI) is an economic indicator that measures changes in prices of consumer goods and services. When prices

[1] With discount $= \frac{\text{price}}{\text{NAV}} - 1 < 0$, net asset value (NAV) $= \frac{\text{assets} - \text{liabilities}}{\text{shares outstanding}}$, if discount > 0, CEF trades at premium. (A)

[2] For current data, see "Quarterly Closed-End Fund Assets" at https://www.ici.org/research/stats/closedend/

increase, interest rates absorb it to be real, consumer spending increases, and investment decreases. In Loughran and Ritter (1995), companies underperform "for five years after" issue taking advantage of their overvaluation.

The worst enemy of banks is high interest rates. The prime interest rate is the benchmark rate for many types of loans, including small, medium-sized businesses and credit cards. The prime rate is the cost that consumers and business must pay for their credit accessibility. For Graham and Harvey (2001, in Baker et al. 2003) and Butler et al. (2006), a decrease in long-term interest rates increases current and non-current liabilities, respectively.

According to the CEF Association (CEFA), CEFs exist long time before "the first mutual fund was formed in the United States. Currently, there are more than 500" CEFs. [3] Among other "investor tools" available at the CEFA site, there is "U.S. [CEFs] Premium & Discount" data classified by equity, fixed-income, and municipal funds.

Under neoclassical theory, if a CEF is risky, its expected return equals a risk premium plus the risk-free rate. This compensates the holder for bearing it. However, this risk premium is proportional to the degree to which the CEF's returns and the market move together. For Perold (2004), the CAPM "was developed" during the 1960s. It is based on the expected utility hypothesis (Savage, 1954), and mean-variance analysis, a theory of asset prices in market equilibrium in which CEF's rate of return's standard deviation measures risk (Bailey, 2005).

This study shows inflation has distinct short and long-term effects on CEFs liquidity. With an inverse relationship between the prime rate and liquidity, CEFs use leverage. According to Datar (2001), an inverse relationship between liquidity and CEFs' discounts is expected. As robustness check, this study estimates the risk-free rate using the CAPM. A validated rate strongly supports the existence of these relations, adding intelligence about CEFs discounts and liquidity.

RELATED LITERATURE

Since Cherkes (2012), there are two broad explanations for CEFs' discounts: under certainty, and noise traders' irrationality. The first refers to rational expectations. Irrationality refers to investor sentiment.

Investor sentiment. According to De Long, Shleifer, Summers and Waldmann (1987), investors suffer fundamental and "noise trader" risks. Fundamental risk refers to prices below NAV (or discounts). Lee, Shleifer and Thaler (1991) conclude that discounts measure "individual investors" sentiment, or noise traders' risk. De Long and Shleifer (1990) "are confident" about discounts (or premiums) affecting underlying stock prices. For Lee et al. (1991), this is a "nonfundamental risk". According to Brown (1999), with irrationality → systematic risk → volatility, "then sentiment should be correlated with volatility." In Burch et al. (2003), discount decreases indicate "small-investor sentiment" or increasing E(costs). "Discounts often vary from" 20+% discount to 10+% premium. Colón, Rodríguez and Romero (2017) "examine shifts on investor sentiment around the last seven US presidential elections (1988 through 2012) as measured by changes in [CEFs] discounts."

Rationality. For Kumar and Noronha (1992) discounts refer to investors' transaction costs, and premiums to distributions (or dividends). In Malkiel (1995), CEFs pricing is affected by "unrealized [capital] appreciation" and restricted stock holdings. Pontiff (1997) notices "there is a tendency for prices to underreact to fundamentals" and concludes that "the average [CEF price] is 64 percent more volatile than its" holdings. In Dimson and Minio (1999), prices are "a function of supply (inelastic) and demand." When liquidated "or open-ending", discount ≥ 0 . On corporate finance, agency costs and liquidity affect discounts. "Most researchers conclude" that CEFs' NAVs are not real. Most investors "buy and hold" avoiding tax issues. Another thing is the "bookkeeping of restricted shares valued as common stocks". According to Damodaran (2001), securities "issued by a company, but not registered with the SEC" can be lent "through private placements". Sales are restricted "for a two-year holding period, [then] limited amounts can be sold". Restricted stocks have a 25 to 35 percent discount range. For Hooks and Erdman (2014), CEFs' discounts are also affected by turnovers, systematic risk, transaction costs, and overstated "price/book".

In Chen et al. (2009, in Hooks and Erdman, 2014), "Taiwanese investors" put their shares when the open-ending is announced, while "foreign investors" hold. For Bae, Bailey, and Mao (2006, in Morck, Yeung, and Yu, 2013), "[s]tocks move more independently after emerging markets allow cross-listings or closed-end country funds into the US [and] UK". Bekaert and Urias (1996) find "wider diversification" decreases discounts in emerging markets funds. Brau and Rodríguez (2009) compare "US and Mexican [CEFs] performance" and conclude that the latter "outperformed US [CEFs] over the long-run". Kacperczyk, Sundaresan and Wang (2018) "show that foreign ownership increases market liquidity, reduces firms' cost of equity," supporting gross (nonresidential) private domestic investment. Froot and Ramadorai (2008, in Kacperczyk et al., 2018) "find that institutional cross-border flows are linked to fundamentals". For CEFs, there is a force vector on price [σ(NAV)], i.e., transfer pricing.

2.1 Recent studies

A CEF bids for shares as the market asks for them. With its policy, a CEF may put part of its holdings, changing its capital structure. In this sense, Lesmond and Nishiotis (2019) conclude "that the underlying bid-ask spread of the CEF holdings"

[3] See "Learn – Overview" at https://www.cefa.com/

is more significant than discounts in forecasting returns. For Su (2020), "corporate governance" induces investors demand and holders increase liquidity, "especially during [bullish] periods". In Song and Jain (2021), "77% of [CEFs] were traded at discount in 2018. Arbitrageurs buy out an entire [CEF, then] liquidate it, or [hold] while shorting its stocks".

Ma's (2022) study assumes "CEFs shares are held primarily by individual investors", where discounts are designed to induce their demand. In this sense, "results are less driven by" rational variables. However, "discounts originate from" liquidity issues, transaction costs, payout policy, and leverage. A CEF uses leverage to deal with organizational or management costs, changes in capital structure, or investment policy. Kumar (2022) studies the effect of tax reforms on CEFs performance, where institutional investors are indifferent.

Dam, Davies and Moon (2023) study the relationship between leverage and discounts. Although returns are not affected by changes in leverage, premiums are strongly related to its risk. They conclude that "investors [are] willing to pay a premium for [it, and] leverage constraints play an important role in asset pricing". According to Durmaz (2023), CEFs "deviate from efficient market theory".

METHODOLOGY

With assets called and liabilities paid recorded as debits, assets shorted and debt recorded as credits in FAs, structured query language and arithmetic, CEFs liquidity and equity data can be fetched from FRED.[4] In terms of net assets and liabilities, let

A_T as "Closed-End Funds; Total Financial Assets, Transactions, Millions of Dollars, Quarterly, Seasonally Adjusted Annual Rate", and

L_T Closed-End Funds; Total Liabilities, Transactions, Millions of Dollars, Quarterly, Seasonally Adjusted Annual Rate.[5]

Then CEFs' liquidity (w_t) is

$$\begin{cases} L_T/A_T & \text{, where } A_T < 0 \text{ , } L_T < 0 \text{ , and } L_T < A_T \text{ ;} \\ A_T/L_T & \text{, } A_T < 0 \text{ , } L_T < 0 \text{ , and } A_T < L_T \text{ ;} \\ |A_T|/L_T & \text{, } A_T < 0 \text{ , } L_T > 0 \text{ , and } |A_T| < L_T \text{ ;} \\ L_T/|A_T| & \text{, } A_T < 0 \text{ , } L_T > 0 \text{ , and } |A_T| > L_T \text{ ;} \\ |L_T|/A_T & \text{, } A_T > 0 \text{ , } L_T < 0 \text{ , and } |L_T| > A_T \text{ ;} \\ A_T/|L_T| & \text{, } A_T > 0 \text{ , } L_T < 0 \text{ , and } |L_T| < A_T \text{ ;} \\ A_T/L_T & \text{, } A_T > 0 \text{ and } L_T > 0 \text{ .} \end{cases}$$

This measures how much liquidity is left at the end of each period. The more assets have been shorted, and (or) less debt incurred, liquidity increases. The more assets have been bought and (or) liabilities paid, liquidity decreases.

According to BLS (2023), the CPI measures "average change over time in the prices paid". In FRED (2023), "price changes are" weight averaged. It "measures price changes (as a percent change) from a predetermined reference date." [6] And MPRIME (2023) "is one of several base rates used by banks to price short-term business loans." [7] Now,

$\ln(w_t) = \alpha_1 + \alpha_2 \ln(w_{t-1}) + \alpha_3 p_{t-\mathbb{N}} + \alpha_4 r_{t-\mathbb{N}} + \alpha_5 t + \varepsilon_1$, where (1)

p_t is "Consumer Price Index for All Urban Consumers: All Items in U.S. City Average, Index 1982-1984=100, Quarterly, Seasonally Adjusted"; and

r_t "Bank Prime Loan Rate, Percent, Quarterly, Not Seasonally Adjusted".

From (A), with $y = discount$, $\Delta\text{shares} = 0$, and $\ln y = \ln[\text{price(shares)} - \text{equity} < \text{equity}]$,
then $\Delta y = -\Delta\text{equity}$.
This refers to the "fact" in Elton, Gruber, Blake, and Shachar (2013) that "almost all [CEFs] auction preferred stock". Next, FRED also publishes corresponding market level values for Real Estate Investment Trusts (REITs) and CEFs equity. Besides, with CEFA discounts (y_t) data, [8] then

$y_t = \phi_1 + \phi_2 y_{t-1} + \phi_3 \Delta w_{t-\mathbb{N}} + \phi_4 \Delta k_{t-\mathbb{N}} + \phi_5 t + \varepsilon_2$, where y_t is (2)

Discount (or Premium), Quarterly, and k_t CEFs' Equity, Level, Millions of Dollars, Quarterly, Not Seasonally Adjusted. See Appendix B for details on how borrowed equity is measured.

[4] See SQL at https://www.w3schools.com/sql/ , and Table F.123 at https://www.federalreserve.gov/apps/fof/guide/f123.pdf
[5] For example, Appendix A
[6] The "seasonally adjusted CPI […] removes the effects of seasonal changes, such as weather, school year, production cycles, and holidays."
[7] Prime rate is "posted by a majority of top 25 (by assets in domestic offices) insured U.S.-chartered commercial banks."
[8] "U.S. Closed-End Funds Premium & Discount Reports" at https://www.cefa.com/investor-tools/premium-discount-reports/

RESULTS

Table 2 follows outlining inflation's short and long-term effects on liquidity.

Table 2: Selected statistics

	Short-term		Long-term	
	α	t-stat	α	t-stat
Liquidity	0.86	1.36	1.04	1.90
Inflation	0.06	1.98	0.01	3.15
Prime rate	-0.10	-2.26	-0.10	-2.40
Trend	-0.06	-1.65	0.001	0.02
Autoregressive	0.24	3.58	0.23	3.46
Observations	210		208	
R-squared	0.25		0.247	
LM-statistic	6.58		7.16	

On average, it confirms the inverse relationship between the prime rate and liquidity. Long-term liquidity is greater. And inflation still affects long-term holdings.

Table 3 balances outcomes within types of funds.

Table 3: Selected funds and statistics

	t-stat						
	ϕ_1	ϕ_3	ϕ_4	ϕ_5	ϕ_2	Obs.	R^2
Equity funds:							
Global	-2.29	-2.10	-2.05	0.42	6.77	40	0.65
Sector Equity	-4.33	2.32	2.58	-0.85	2.42	41	0.34
Value	-5.25	-2.02	-2.58	1.29	4.19	31	0.61
Fixed-income funds:							
Corporate BBB-Rated Debt (Leveraged)	-2.83	-2.55	2.17	0.47	6.94	37	0.64
General Bond	-1.22	3.95	-2.54	1.02	5.85	36	0.69
Loan Participation	-1.21	3.17	-2.50	0.00	7.42	36	0.63
Municipal Debt Funds:							
High Yield	0.66	3.27	-2.07	-1.74	5.54	36	0.63
Intermediate	0.21	-2.40	-2.16	-1.98	4.11	36	0.52
New Jersey	-1.89	2.76	3.41	-0.48	6.90	41	0.65
New York	-0.73	2.06	2.97	-1.28	6.01	40	0.65
Other States	-0.11	2.05	3.59	-0.70	8.00	40	0.68
Other funds:							
Convertible Securities	-3.27	2.58	2.96	1.59	4.70	35	0.54
Income & Preferred Stock	0.37	2.69	-2.10	-0.53	10.53	36	0.77

It shows liquidity and equity effects on discounts for each selected type of fund. On average, most of them trade at discount. Liquidity and equity interact independently among them. And AR(1) is also relevant.

4.1 Robustness

$r_{CEF_t} = r_F + \beta\left(r_{m_t} - \Delta\%w_{t-\mathbb{N}}\right) + \varepsilon_3$, where (3)

r_{CEF_t} is CRSP´s CEF prices, % Chg., Quarterly, Not Seasonally Adjusted,
r_F risk-free rate, and
r_{m_t} "NASDAQ Composite Index, % Chg., Quarterly, Not Seasonally Adjusted"

Next, Table 4 tests CEF returns with a liquidity-adjusted CAPM (3).

Table 4: Selected tickers and statistics

	Ticker	t-stat	R^2	LM-stat	Obs.
	ARXX				
Risk-free	3.7%	0.93	0.17	0.69	63
Beta (CAPM)	0.10	3.61			
Split beta	1.82	8.48	0.59	1.20	
Liquidity	-0.13	-6.46			
	AEN.2				
Risk-free	0.8%	0.21	0.06	0.34	70
Beta (CAPM)	0.05	2.11			
Split beta	0.46	1.71	0.09	1.01	
Liquidity	-0.05	-2.10			
	UDI.1				
Risk-free	1.7%	0.49	0.18	0.74	58
Beta (CAPM)	0.08	3.53			
Split beta	0.44	1.64	0.21	1.96	
Liquidity	-0.08	-3.34			
	AIR				
Risk-free	0.6%	0.31	0.05	0.87	158
Beta (CAPM)	0.04	2.94			
Split beta	1.00	7.25	0.28	4.35	
Liquidity	-0.03	-2.32			

Table 4 shows risk-free rate estimates, systematic risk (Beta), indirect (or partial) effects of market risk, and liquidity rate on selected CEF returns. Although the risk-free rate presence reduces CAPM´s goodness of fit, systematic risk holds. When split, market risk gets significance exposing an inverse relationship between liquidity rate and these CEF returns.

CONCLUSIONS

The “core business” of CEFs is trading undervalued securities (Damodaran, 2001). CEFs are great for teaching financial theory. Whenever capital appreciation is recognized, distributions of gains increase. Borrowed securities decrease NAV. Discounts (or premiums) are financial tools for CEFs. However, discounts prevail whenever liquidity issues arise. Interest rates absorb inflation to be real, consumer spending increases, and investment decreases. The prime rate is the cost that consumers and business must pay for their credit accessibility.

On average, an inverse relationship between the prime rate and CEFs’ liquidity is confirmed. Long-term liquidity is greater, but inflation affects these long-term holdings. Indeed, CEFs are also designed to catch up with inflation. This study shows liquidity and equity interact independently among each type of CEFs. With discounts of different types of funds, affected by liquidity and equity, Datar (2001) “liquidity conjecture” cannot be rejected. Neither with equity.

This study estimates the risk-free rate and systematic risk for CEF returns. In the CAPM, instead of the risk-free rate, when liquidity rate is subtracted from market risk, systematic risk decreases for CEFs being tested. However, the presence of the risk-free rate increases CAPM´s validity and systematic risk exists. When split, market risk relevance exposes an inverse relationship between liquidity rate and CEF returns. This approach provides further intelligence about market risk and liquidity rate having partial effects on CEF returns. Here, liquidity rate does not exactly decrease discounts, but returns.

It is possible to test an equity “hypothesis” on CEF discounts. Exposure to global equity and debt affects their liquidity. Assuming regulation, this suggests that foreign direct investment in their underlying securities (or companies) may also affect premiums.

REFERENCES

[1] Anderson, S. C.; Born, J. A. (1992). Closed-End Fund Pricing: Theories and Evidence. Springer Science.
[2] Anderson, S. C.; Born, J. A. (2002). Closed-End Investment Companies: Issues and Answers. Springer Science.
[3] Bailey, R. (2005). The Economics of Financial Markets. Cambridge University Press. doi:10.1017/CBO9780511817458
[4] Baker, M.; Greenwood, R.; Wurgler, J. (2003). The maturity of debt issues and predictable variation in bond returns. *Journal of Financial Economics* 70, 261–291. https://doi.org/10.1016/S0304-405X(03)00147-8

[5] Bekaert, G.; Urias, M. (1996). Diversification, Integration and Emerging Market Closed-End Funds. *The Journal of Finance* 51(3). https://doi.org/10.2307/2329224
[6] Benveniste, L. M.; Spindt, P. A. (1989). How investment bankers determine the offer price and allocation of new issues. *Journal of Financial Economics* 24, 343–361. https://doi.org/10.1016/0304-405X(89)90051-2
[7] BLS (2023). Consumer Price Index. U.S. Bureau of Labor Statistics [BLS]. https://www.bls.gov/cpi/
[8] Brau, J.; Rodríguez, J. (2009). An empirical analysis of Mexican and US closed-end mutual fund IPOs. *Research in International Business and Finance* 23. https://doi.org/10.1016/j.ribaf.2008.03.001
[9] Brown, G. (1999). Volatility, Sentiment, and Noise Traders. *Financial Analysts Journal* 55(2). http://www.jstor.org/stable/4480157
[10] Burch, T.; Emery, D.; Fuerst, M. (2003). What Can 'Nine-Eleven' Tell Us About Closed-End Fund Discounts and Investor Sentiment. *SSRN Working Paper*. https://ssrn.com/abstract=420961
[11] Butler, A. W.; Grullon, G.; Weston, J. P. (2006). Can managers successfully time the maturity structure of their debt issues? *Journal of Finance 61*, 1731–1758. https://doi.org/10.1111/j.1540-6261.2006.00888.x
[12] Cherkes, M. (2012). Closed-End Funds: A Survey. *Annual Review of Financial Economics* 4. https://ssrn.com/abstract=2170918
[13] Colón-De-Armas, C.; Rodríguez, J.; Romero, H. (2017). "Investor sentiment and US presidential elections". *Review of Behavioral Finance* 9(3). https://doi.org/10.1108/RBF-02-2016-0003
[14] Dam, R.; Davies, S.; and Moon, K. (2023). Investor Demand for Leverage: Evidence from Equity Closed-End Funds. *The Review of Asset Pricing Studies* raad012. https://doi.org/10.1093/rapstu/raad012
[15] Damodaran, A. (2001). Corporate Finance: Theory and Practice. Wiley.
[16] Datar, V. (2001). Impact of liquidity on premia/discounts in closed-end funds. *The Quarterly Review of Economics and Finance* 41. https://doi.org/10.1016/S1062-9769(00)00065-X
[17] De Long, J.; Shleifer, A. (1990). THE BUBBLE OF 1929: EVIDENCE FROM CLOSED-END FUNDS. *NBER Working Paper* 3523. https://www.nber.org/system/files/working_papers/w3523/w3523.pdf
[18] De Long, J.; Shleifer, A.; Summers, L.; Waldmann, R. (1987). The Economic Consequences of Noise Traders. *NBER Working Paper* 2395. https://www.nber.org/papers/w2395
[19] Deo, P. (2023). Project Financial Analysis Within a Firm. *Journal of Accounting and Finance* 23. https://articlegateway.com/index.php/JAF/article/view/5831/5529
[20] Dimson, E.; Minio, C. (1999). Closed-End Funds: A Survey. Forthcoming in *Financial Markets, Institutions & Instruments*. https://doi.org/10.2139/ssrn.135688
[21] Durmaz, N. (2023). Closed-End Fund Discounts and Economic Policy Uncertainty. *Journal of Risk and Financial Management* 16(3). https://doi.org/10.3390/jrfm16030200
[22] Elton, E.; Gruber, M.; Blake, C.; Shachar, O. (2013). Why Do Closed-End Bond Funds Exist? An Additional Explanation for the Growth in Domestic Closed-End Bond Funds. *The Journal of Financial and Quantitative Analysis* 48(2). http://www.jstor.org/stable/43303806
[23] FRED (2023). Consumer Price Index for All Urban Consumers: All Items in U.S. City Average. Federal Reserve Bank of St. Louis [FRED]. https://fred.stlouisfed.org/series/CPIAUCSL
[24] Hooks, J.; Erdman, S. (2014). Turnover And Closed-End Fund Discounts. *Journal of Business & Economics Research* 12(4). https://doi.org/10.19030/jber.v12i4.8862
[25] Kacperczyk, M.; Sundaresan, S.; Wang, T. (2018). Do Foreign Investors Improve Market Efficiency? *NBER Working Paper* 24765. https://www.nber.org/system/files/working_papers/w24765/w24765.pdf
[26] Kumar, R.; Noronha, G., (1992). A RE-EXAMINATION OF THE RELATIONSHIP BETWEEN CLOSED-END FUND DISCOUNTS AND EXPENSES. *Journal of Financial Research* 15(2). https://doi.org/10.1111/j.1475-6803.1992.tb00794.x
[27] Kumar, U. (2022). Tax Reforms, Investor Sentiment and Closed-End Fund Performance. *International Journal of Finance* 7(4). https://doi.org/10.47941/ijf.1040
[28] Lee, C.; Shleifer, A.; Thaler, R. (1991). Investor Sentiment and the Closed-End Fund Puzzle. *The Journal of Finance* 46(1). https://doi.org/10.2307/2328690
[29] Lesmond, D.; Nishiotis, G. (2019) Closed-End Funds. https://ssrn.com/abstract=2695109
[30] Loughran, T.; Ritter, J. R. (1995). The New Issues Puzzle. *The Journal of Finance* 50(1), 23–51. https://doi.org/10.2307/2329238
[31] Ma, L. (2022). What Drives Closed-End Fund Discounts? Evidence from COVID-19. *SSRN Working Paper*. http://dx.doi.org/10.2139/ssrn.3793904
[32] Malkiel, B. (1977). The Valuation of Closed-End Investment-Company Shares. *The Journal of Finance* 32(3). https://www.jstor.org/stable/2326318
[33] Malkiel, B. (1995). The Structure of Closed-End Fund Discounts Revisited. *Journal of Portfolio Management* 21(4). http://dx.doi.org/10.3905/jpm.1995.409534
[34] Morck, R.; Yeung, B.; Yu, W. (2013). R-squared and the Economy. *NBER Working Paper* 19017. https://www.nber.org/system/files/working_papers/w19017/w19017.pdf
[35] MPRIME (2023). Board of Governors of the United States Federal Reserve System, Bank Prime Loan Rate [MPRIME] data, https://www.federalreserve.gov/faqs/credit_12846.htm
[36] Phillips H.; Ritchie J. (1983). Investment analysis & portfolio selection. (2nd ed.) South-Western Pub. Co. https://search.worldcat.org/title/9357057

[37] Perold, A. (2004). The capital asset pricing model. *Journal of Economic Perspectives* 18(3). doi.org/10.1257/0895330042162340
[38] Pontiff, J. (1997). Excess Volatility and Closed-End Funds. *The American Economic Review* 87(1). http://www.jstor.org/stable/2950859
[39] Pratt, E. (1966). Myths Associated with Closed-End Investment Company Discounts. *Financial Analysts Journal* 22(4). https://www.jstor.org/stable/4470025
[40] Samuelson, P.; Nordhaus, W. (2009). Macroeconomics. McGraw Hill.
[41] Savage, L. (1954). The Foundations of Statistics. John Wiley & Sons.
[42] Schonfeld, V.; Kerwin, T. (1993). Organization of a Mutual Fund. *The Business Lawyer* 49(1). http://www.jstor.org/stable/40687456
[43] Song, G.; Jain, A. (2021). Revisit Closed-End Fund Puzzles via Dynamic Capital Mobility. *International Journal of Economics and Financial Issues* 11(4). https://doi.org/10.32479/ijefi.11373
[44] Su, J. (2020). Corporate Governance, Noise Trading and Liquidity of Stocks. *arXiv: Trading and Market Microstructure*. https://doi.org/10.48550/arXiv.2001.06275

Appendix A

With "Real Estate Investment Trusts [REITs] and Closed-End Funds; Total Liabilities and Equity, Transactions, Millions of Dollars, Quarterly, Seasonally Adjusted Annual Rate" (REITLET+CEFLET) 1968Q1 values, then Closed-End Funds; Total Liabilities, Transactions, Millions of Dollars, Quarterly, Seasonally Adjusted Annual Rate (CEFLT) is

Then	CEFAT	304	With	**REITLET+CEFLET**	**956**	
			Less	REITLT+CEFLT	884	
				REITET+CEFET		72
				REITLT		580
				REITAT+CEFET		652
			Less	REITAT		600
Less	CEFET	52				
	CEFLT	**252**				

Appendix B

FRED publishes "Real Estate Investment Trusts and Closed-End Funds; Net Lending (+) or Borrowing (-) [FA], Level, Millions of Dollars, Quarterly, Not Seasonally Adjusted" (REITE+CEFE).[9] For example, with 2023Q2 values

REITA+CEFA	1,123,252	REITL+CEFL	1,625,557
		REITE+CEFE	-502,305
		Less REITE	766,422
		CEFE	**-1,268,727**

because REITE+CEFE is decreasing (FA < 0), and REITs equity (REITE) is increasing (Level > 0); [10] CEFs liabilities (CEFL) increase (Level > 0) as CEFs equity (CEFE) decreases and CEFs assets (CEFA) increase. For FRED, CEFA = CEFL, why? Because it assumes there is no change in *CEFs domestic equity*. According to Elton et al. (2013), "almost all [CEFs] borrow" equity. Therefore, CEFE < 0 means equity being borrowed. In this sense,

$$\Delta CEFE = |CEFE_t| - |CEFE_{t-1}| \rightarrow \Delta CEFA$$

When CEFE > 0 is equity being lend also affecting CEFA.

[9] Retrieved from https://fred.stlouisfed.org/series/BOGZ1FL495000005Q
[10] "Real Estate Investment Trusts; Equity Capital, Level" at https://fred.stlouisfed.org/series/BOGZ1FL645080005Q