Stochastic Discounted Cash Flow

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Overview

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- Ford è la seconda più grande produttrice di auto negli U.S.A (dopo General Motors) e la quinta nel mondo (dopo Toyota, Volkswagen, Hyundai-Kia and General Motors)

DCF

Anno	**Free Cash Flow**	**Present Value**
2019		
2020		
2021		
2022		
2023		
⋮		
∞		

DCF

Anno	**Free Cash Flow**	**Present Value**
2019	$FCFF_{2019}$	
2020	$FCFF_{2020}$	
2021	$FCFF_{2021}$	
2022	$FCFF_{2022}$	
2023	$FCFF_{2023}$	
$\vdots$		
∞		

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$\vdots$		
∞	TV	

DCF

Anno	**Free Cash Flow**		**Present Value**
2019	$FCFF_{2019}$	$\longmapsto$	PV_{2019}
2020	$FCFF_{2020}$		PV_{2020}
2021	$FCFF_{2021}$		PV_{2021}
2022	$FCFF_{2022}$		PV_{2022}
2023	$FCFF_{2023}$		PV_{2023}
$\vdots$			
∞	TV	$\longmapsto$	PV_{TV}

DCF

Anno	**Free Cash Flow**		**Present Value**	
2019	$FCFF_{2019}$	$\longmapsto$	PV_{2019}	$+$
2020	$FCFF_{2020}$		PV_{2020}	$+$
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$\vdots$				
∞	TV	$\longmapsto$	PV_{TV}	$=$
			Firm Value	

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$\vdots$				
∞	TV	$\longmapsto$	PV_{TV}	$=$
			Firm Value	-
			Market Value of Debt	

DCF

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			Number of Shares	

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Value of Stock

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$\vdots$				
∞	TV	$\longmapsto$	PV_{TV}	$=$
			Firm Value	-
			Market Value of Debt	/
			Number of Shares	$=$
			Value of Stock	

$$PresentValue = \frac{Value}{(1 + WACC)^{\Delta anni}}$$

Discount Rate

Weighted Average Cost of Capital

$$WACC = \frac{Value_{equity}}{Value_{capital}} Cost_{equity} + (1 - tax) \frac{Value_{debt}}{Value_{capital}} Cost_{debt}$$

$$Value_{capital} = Value_{equity} + Value_{debt}$$

Discount Rate - Equity

Valore

$$Value_{equity} = \underbrace{Number_{shares}}_{\text{seg.gov 10k}} \times \underbrace{Value_{shares}}_{\text{Yahoo Finance}}$$

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$$= 30'401'100'000\ \$$$

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Costo

$$Cost_{equity} = \underbrace{Riskfree}_{\text{fred.stlouisfed.org}} + \underbrace{\beta}_{\text{hist\_stock\_data.m}} \underbrace{(MarketPremium - Riskfree)}_{\text{Damodaran ERP}}$$

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$$= 2.69 + \beta \times 5.96$$
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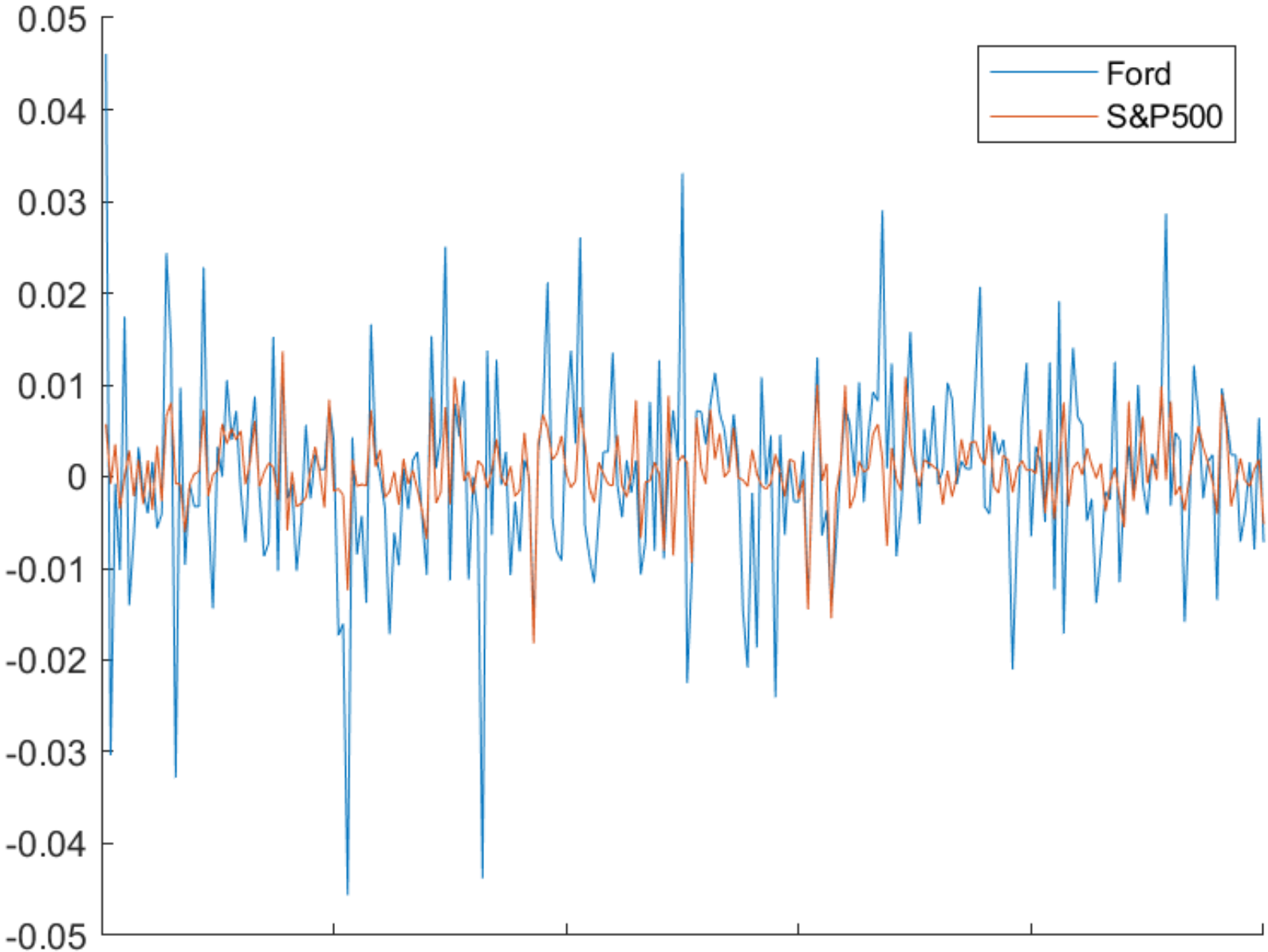
$$= 9.74\%$$

$$\beta = \frac{Cov(R_{ford}, R_{market})}{Var(R_{market})}$$


0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
Ford
S&P500

Discount Rate - Debt

Valore

$$Value_{debt} = \underbrace{Interest_{debt}}_{\text{sec.gov 10k}} \frac{1-\frac{1}{(1+Cost_{debt})^{Maturity}}}{Cost_{debt}} + \underbrace{MarketVal_{debt}}_{\text{Morningstar}} \frac{1}{(1+Cost_{debt})^{Maturity}}$$

Discount Rate - Debt

Interest on Debt = 1'200'000'000 $
Market Value of Debt = 93'635'000'000 $
Maturity = 15 anni (Bond)

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$$= 1'200'000'000 \times 10.6734 + 93'635'000'000 \times 0.5101$$
$$= 60'570'440'820\ \$$$

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Costo

$$Cost_{debt} = \underbrace{Riskfree}_{\text{fred.stlouisfed.org}} + \underbrace{Spread}_{\text{Moody's Baa3 moto.it}}$$

$$= 2.69 + 1.9$$
$$= 4.59\%$$

Discount Rate

Weighted Average Cost of Capital

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$$= 0.334 \times 9.74 + (1 - 0.27) 0.665 \times 4.59$$

$$= \boxed{\mathbf{5.65\%}}$$

Free Cash Flow - Data

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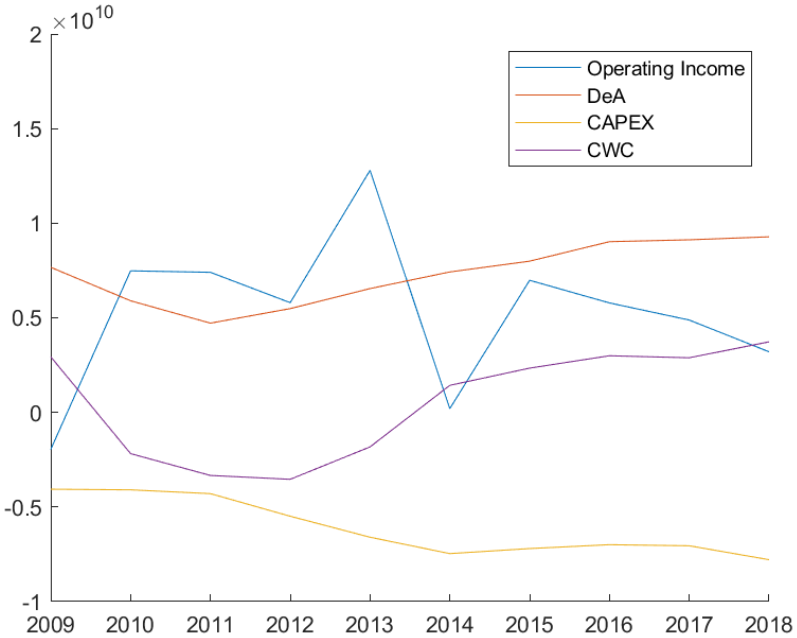

EBIT = Earnings Before Interest

D&A = Depreciation and Amortization

CAPEX = Capital Expenditures

ΔNWC = Changes in Net Working Capital

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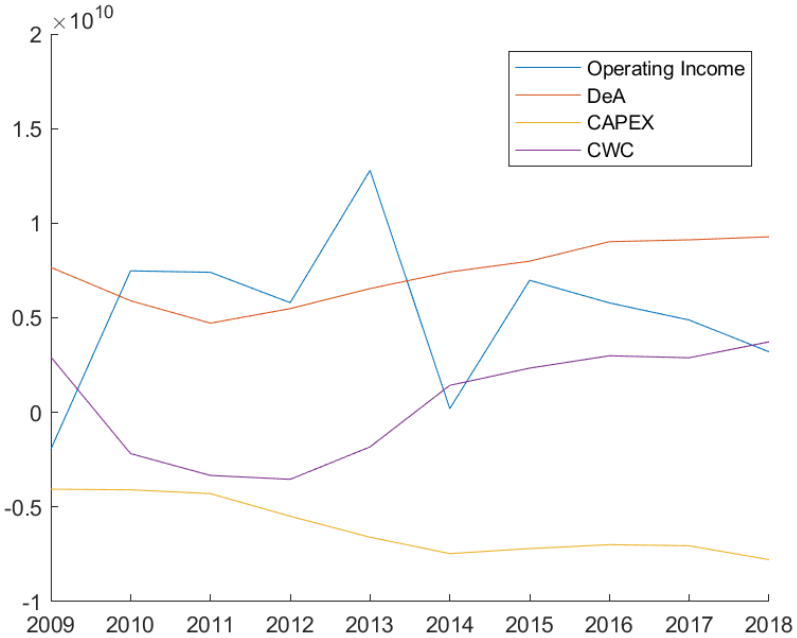

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$$FreeCashFlowToFirm = FCFF = EBIT(1-Tax)+D\&A+CAPEX+\Delta NWC$$

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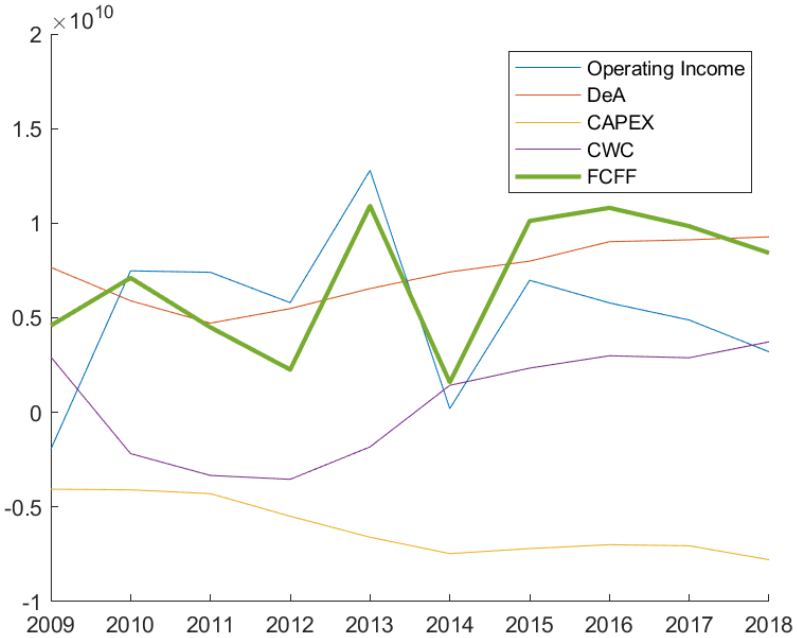

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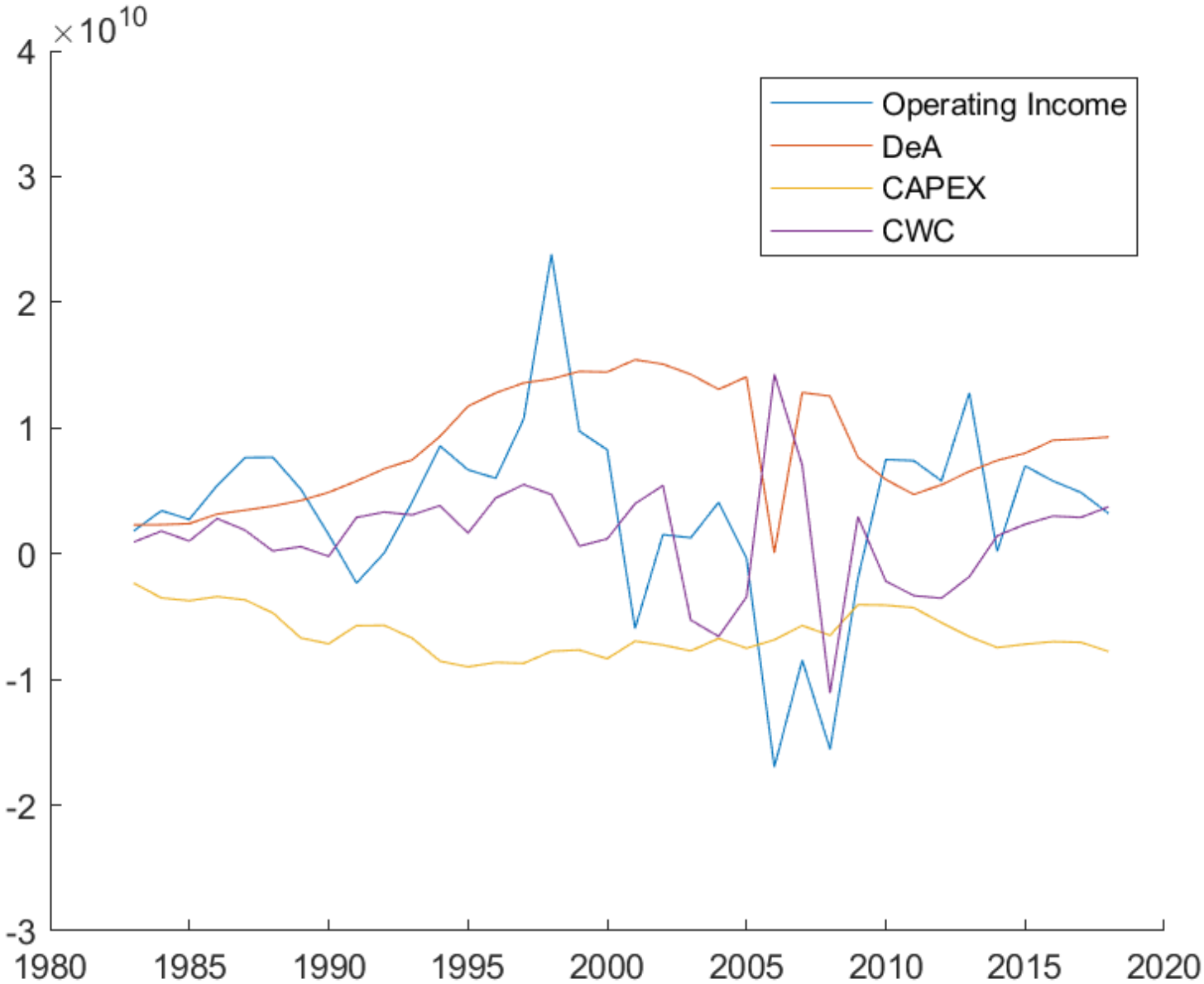

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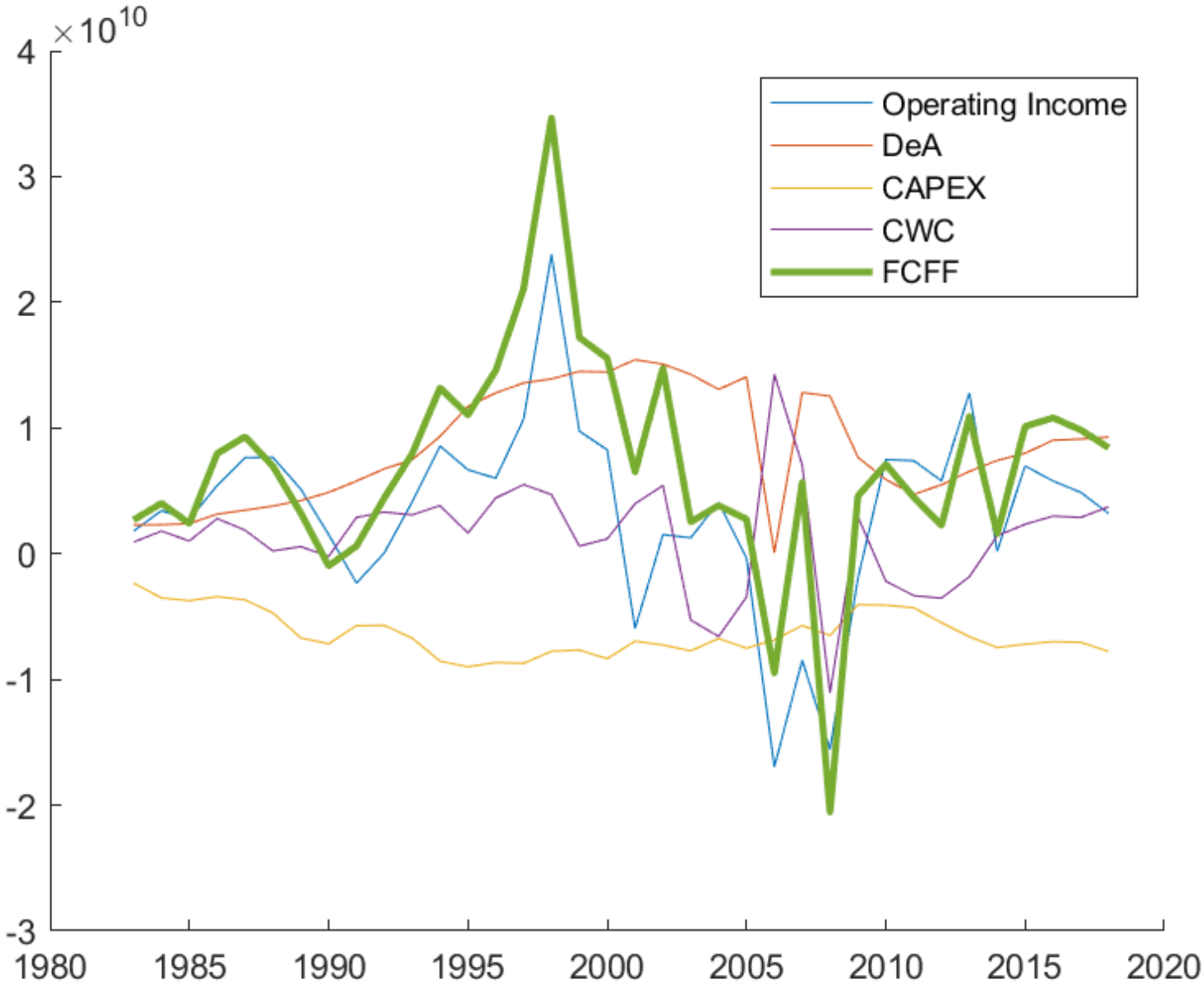

Free Cash Flow - Grow Rate

$$GrowRate_i = \frac{FCFF_{i+1} - FCFF_i}{|FCFF_i|} \qquad \text{per } i = 1983, ..., 2017$$

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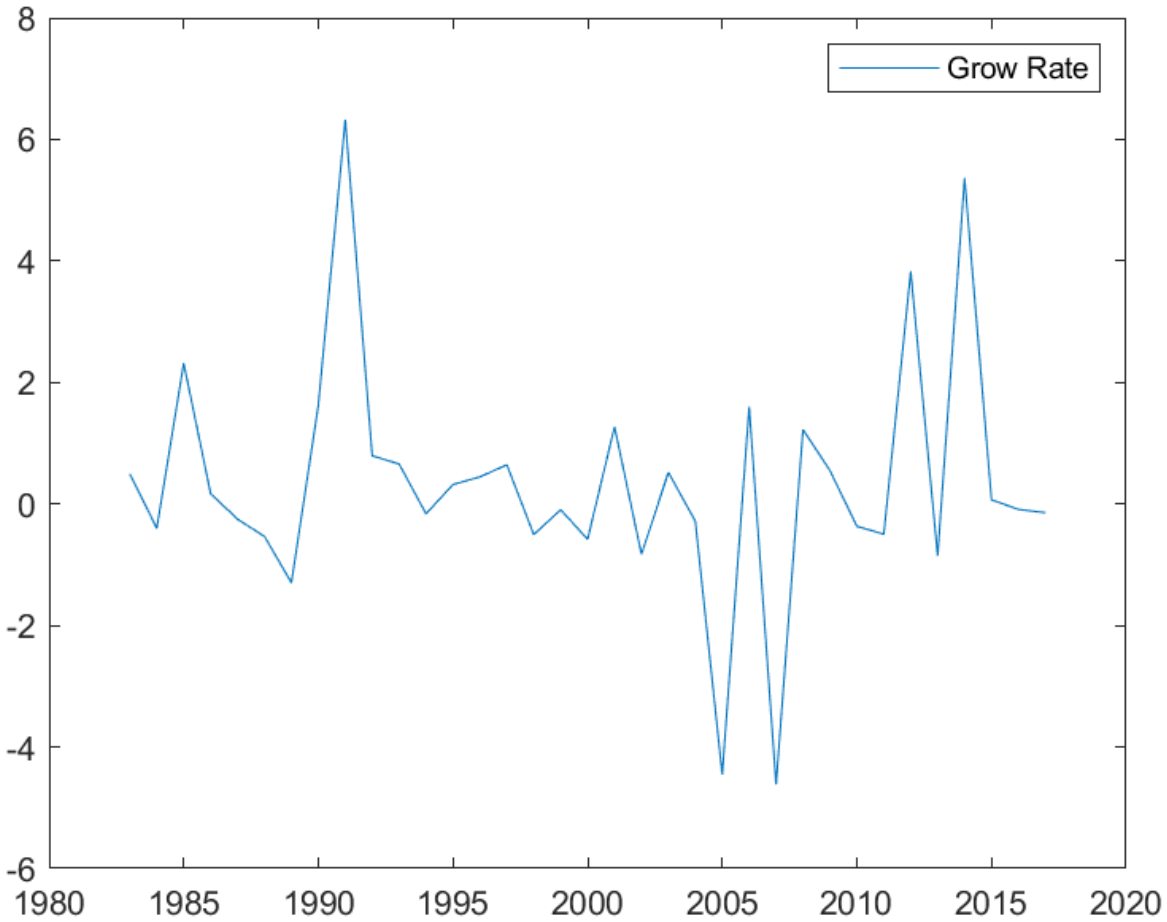

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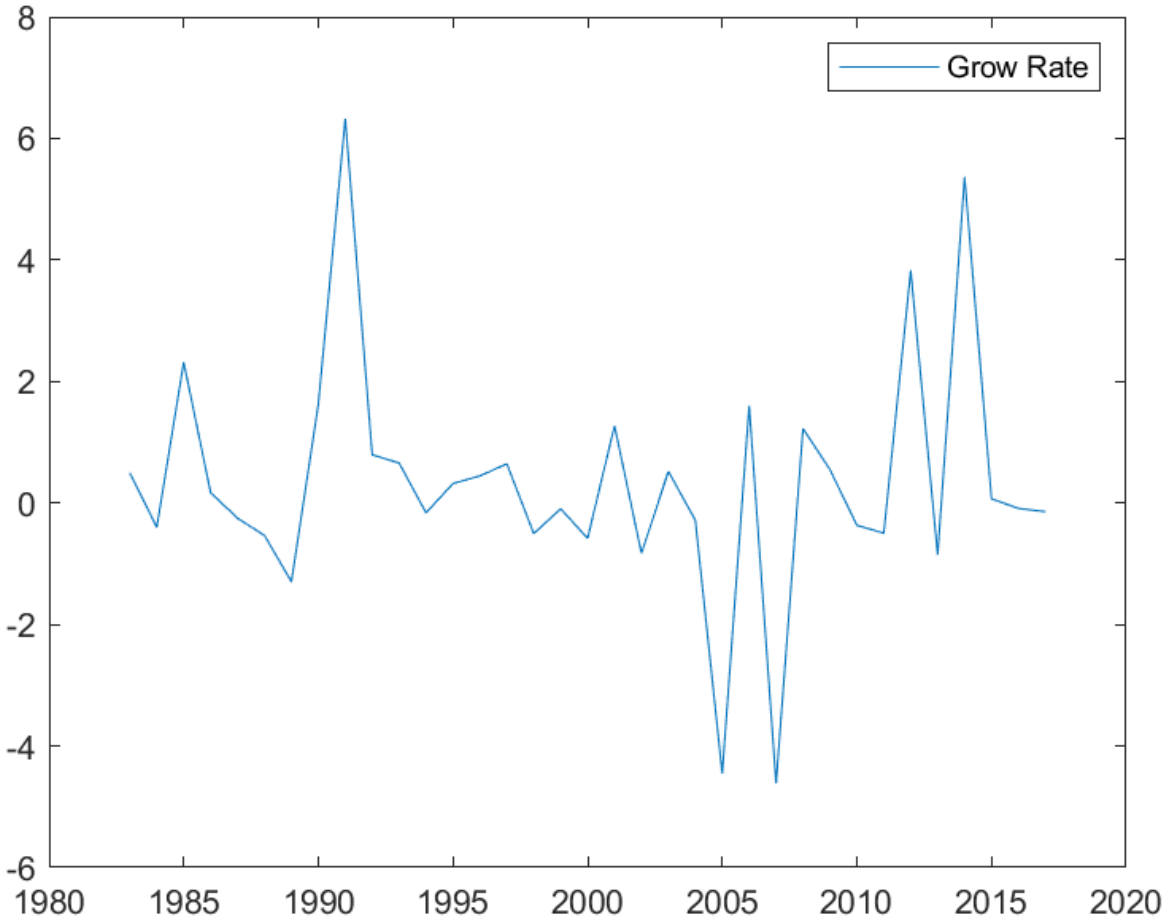
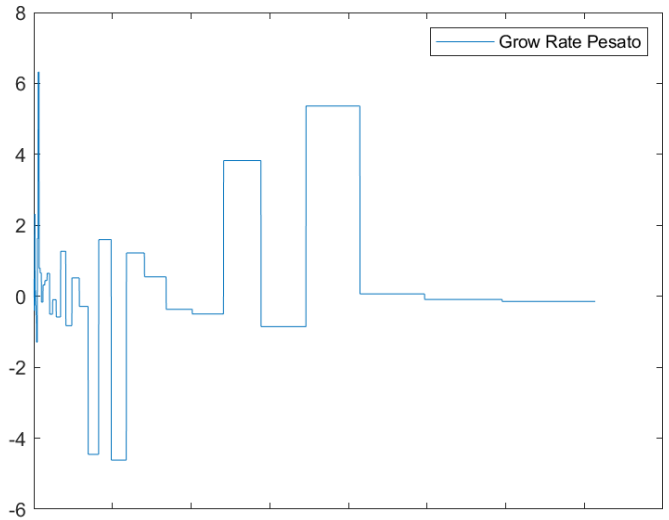


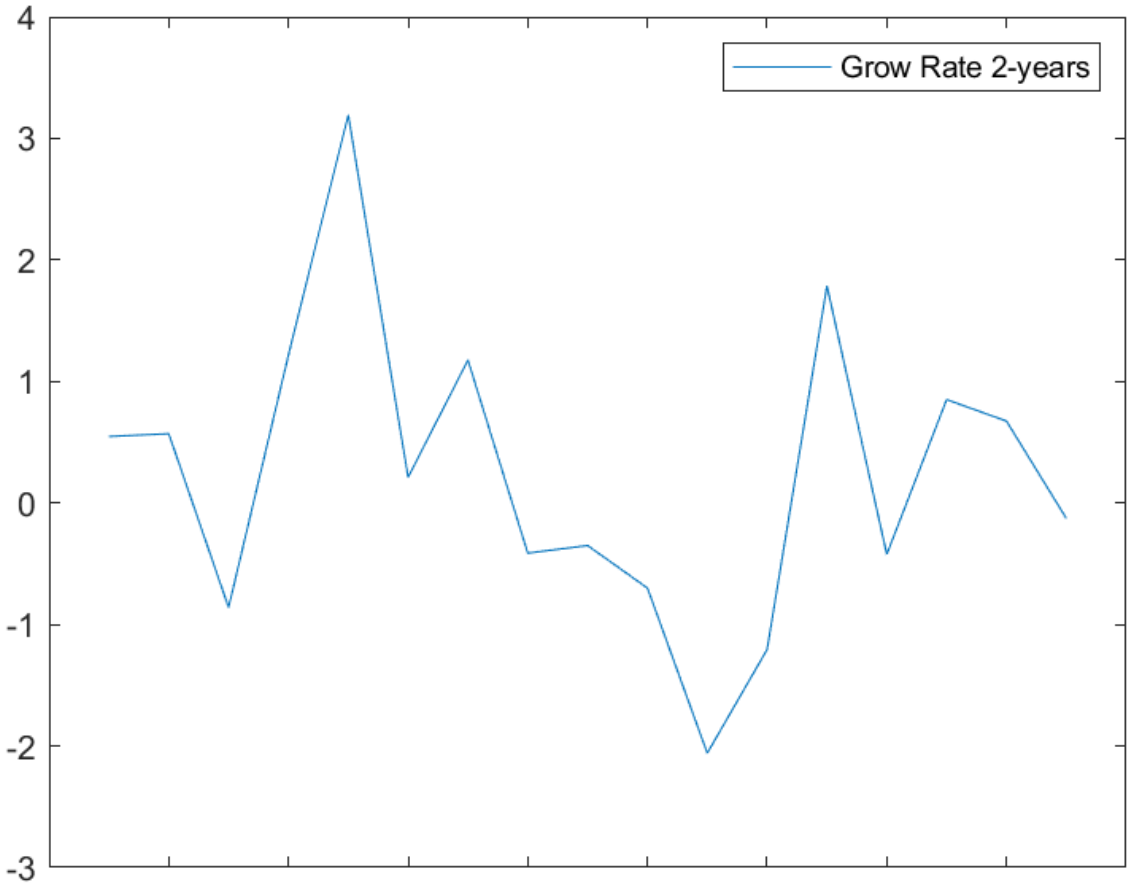
Dando maggiore importanza agli ultimi anni (fattore $\times 1.2$)



$$\mathbb{E}[GR] = 0.5357$$
$$Var(GR) = 2.1721$$

Free Cash Flow - Grow Rate Mediato

Invece mediando su coppie di anni consecutive si ottiene:



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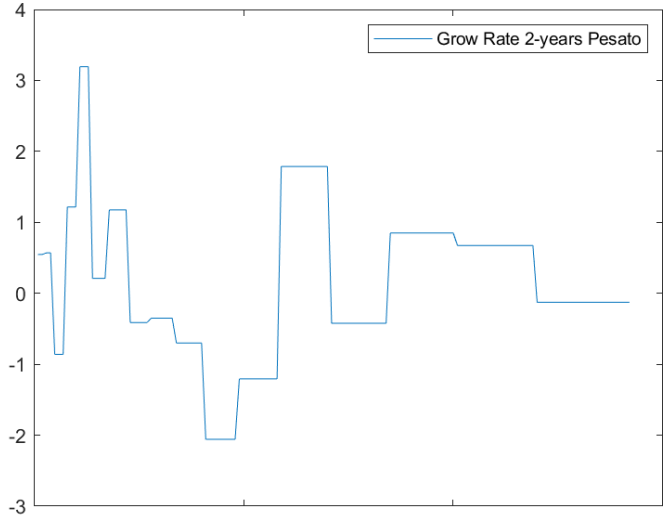
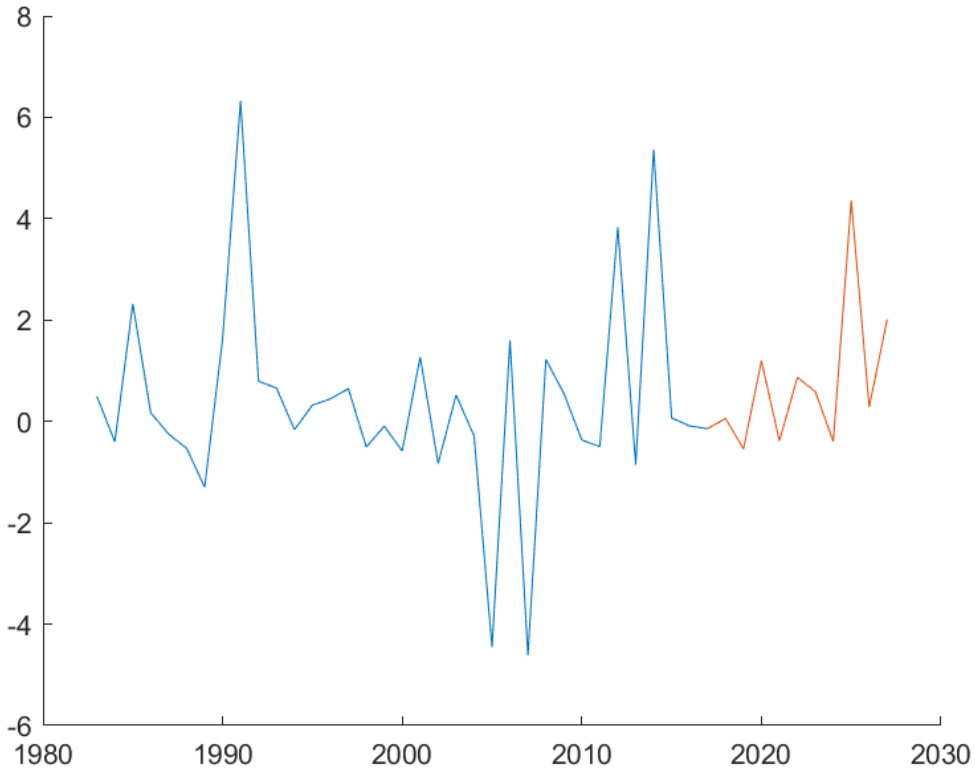


$$\mathbb{E}[GR] = 0.3848$$
$$Var(GR) = 1.0563$$

Free Cash Flow - Future Grow Rate

Ipotizziamo i Grow Rate nei prossimi 10 anni utilizzando una Gaussiana



$$N(\mathbb{E}[GR], Var(GR))$$

Free Cash Flow - Future FCFF

Calcoliamo i Free Cash Flow to Firm nei prossimi 10 anni utilizzando

$$FCFF_i = FCFF_{i-1} + GrowRate_{i-1} \, |FCFF_{i-1}| \qquad \text{per } i = 2019, \ldots, 2028$$

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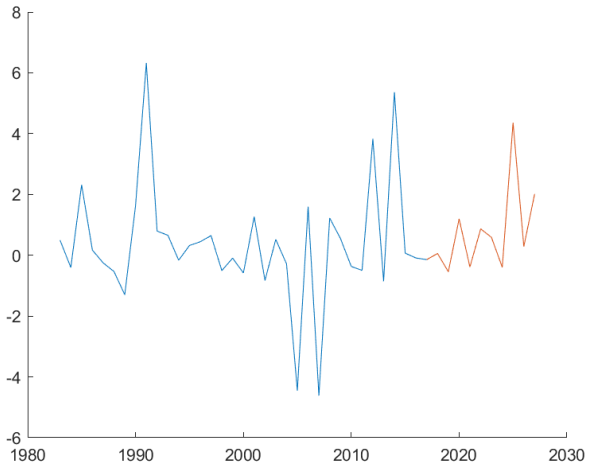

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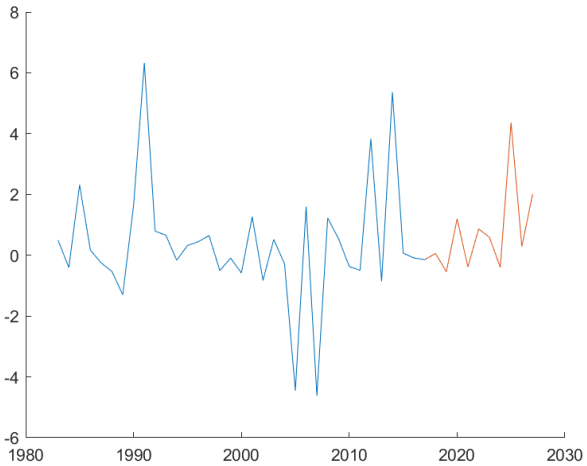

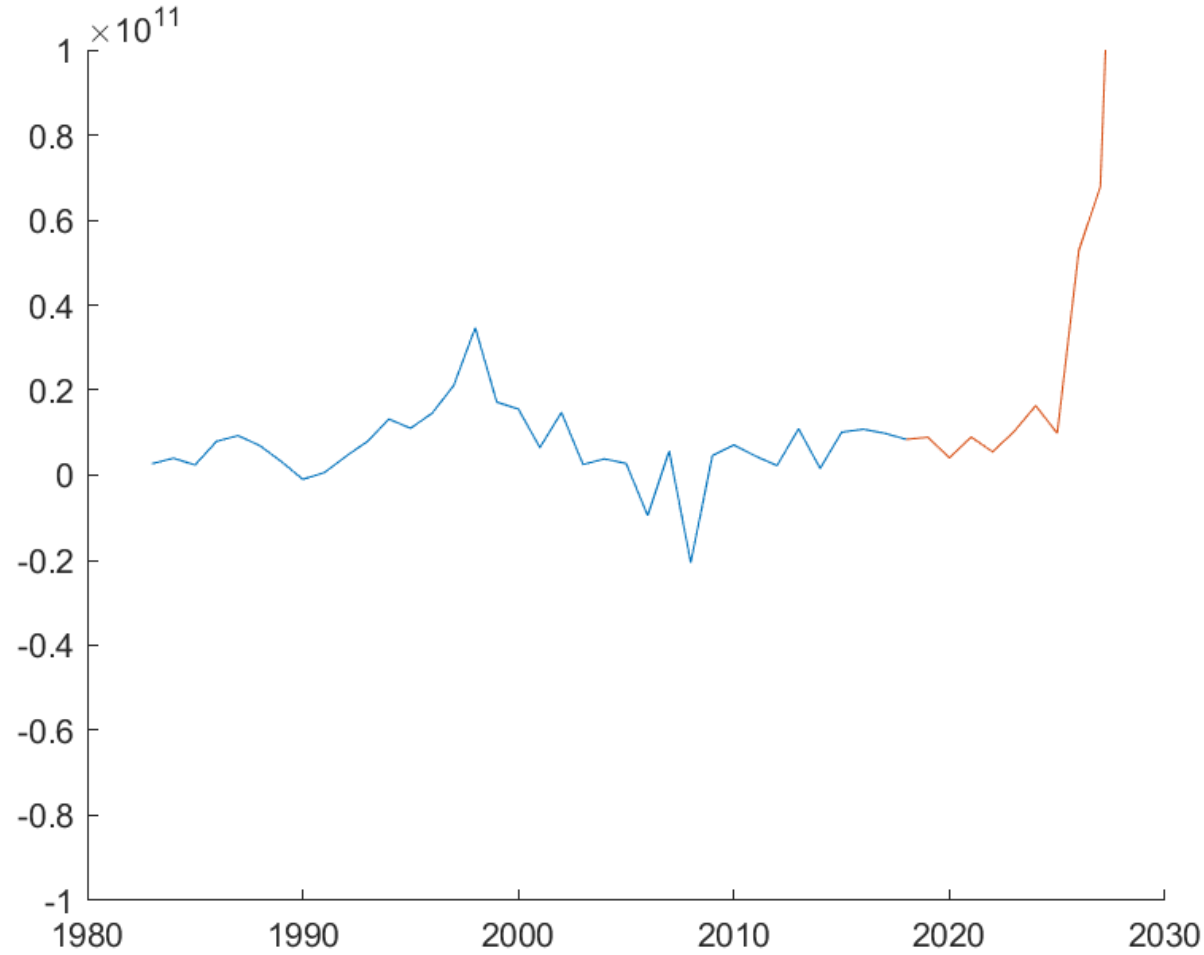

Free Cash Flow - Terminal Value

Terminal Value

$$
\begin{aligned}
TV_0 &= \sum_{i=1}^{\infty} PV_0(FCFF_i) = \\
&= \sum_{i=1}^{\infty} \frac{FCFF_0(1+GR)^i}{(1+WACC)^i} = \\
&= FCFF_0 \sum_{i=1}^{\infty} \left(\frac{1+GR}{1+WACC} \right)^i = \\
&= FCFF_0 \frac{1+GR}{1+WACC} \frac{1}{1-\frac{1+GR}{1+WACC}} = FCFF_0 \frac{1+GR}{WACC-GR}
\end{aligned}
$$

$\text{WACC} = 5.65\%$ $\qquad$ $\text{GR} = \text{TerminalGrowRate} := \mathbb{E}[FutureGrowRate]$

Results

Firm Value

$$FirmValue = \sum_{i=1}^{10} \frac{FCFF_{2018+i}}{(1+WACC)^i} + \frac{TV}{(1+WACC)^{10}}$$

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Firm Value

$$FirmValue = \sum_{i=1}^{10} \frac{FCFF_{2018+i}}{(1+WACC)^i} + \frac{TV}{(1+WACC)^{10}}$$

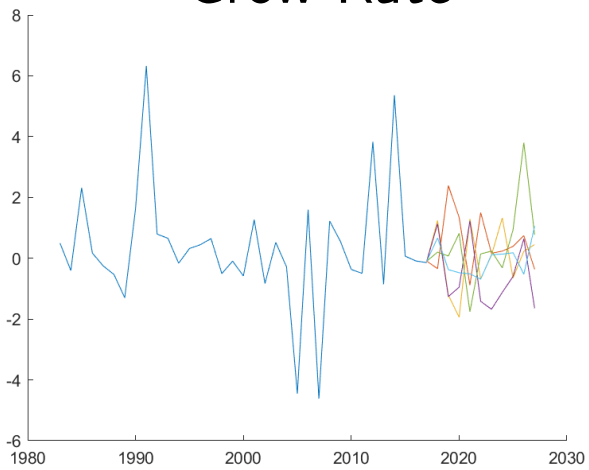
Stock Value

$$StockValue = \frac{FirmValue - MarketValueOfDebt}{NumberOfShares}$$

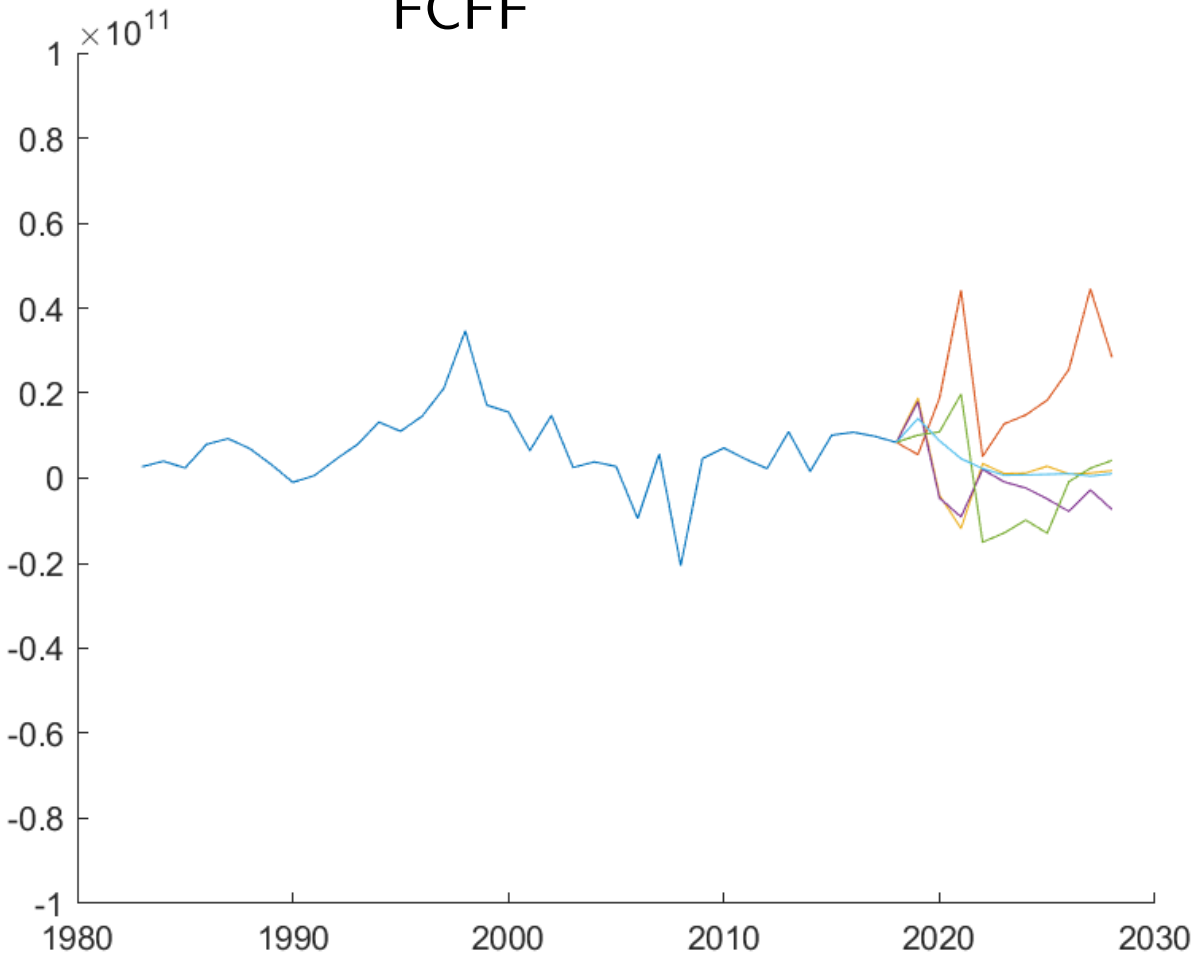
Montecarlo Simulation

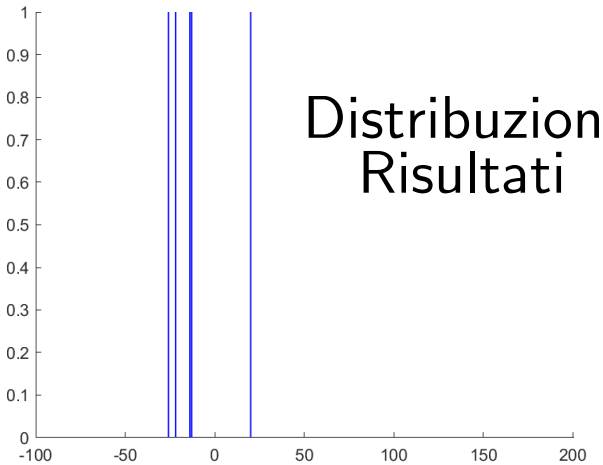
Numero simulazioni = 5

Grow Rate



FCFF



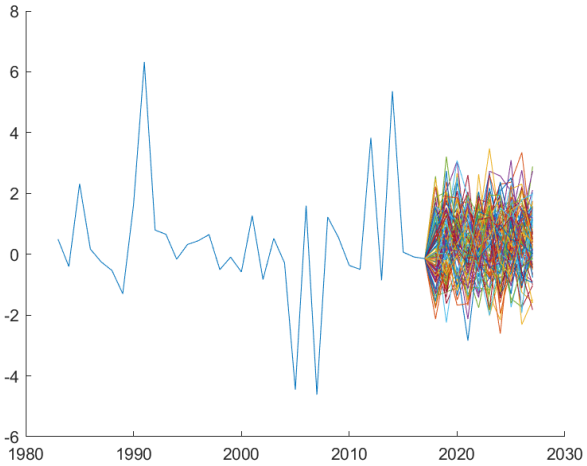


Distribuzione Risultati

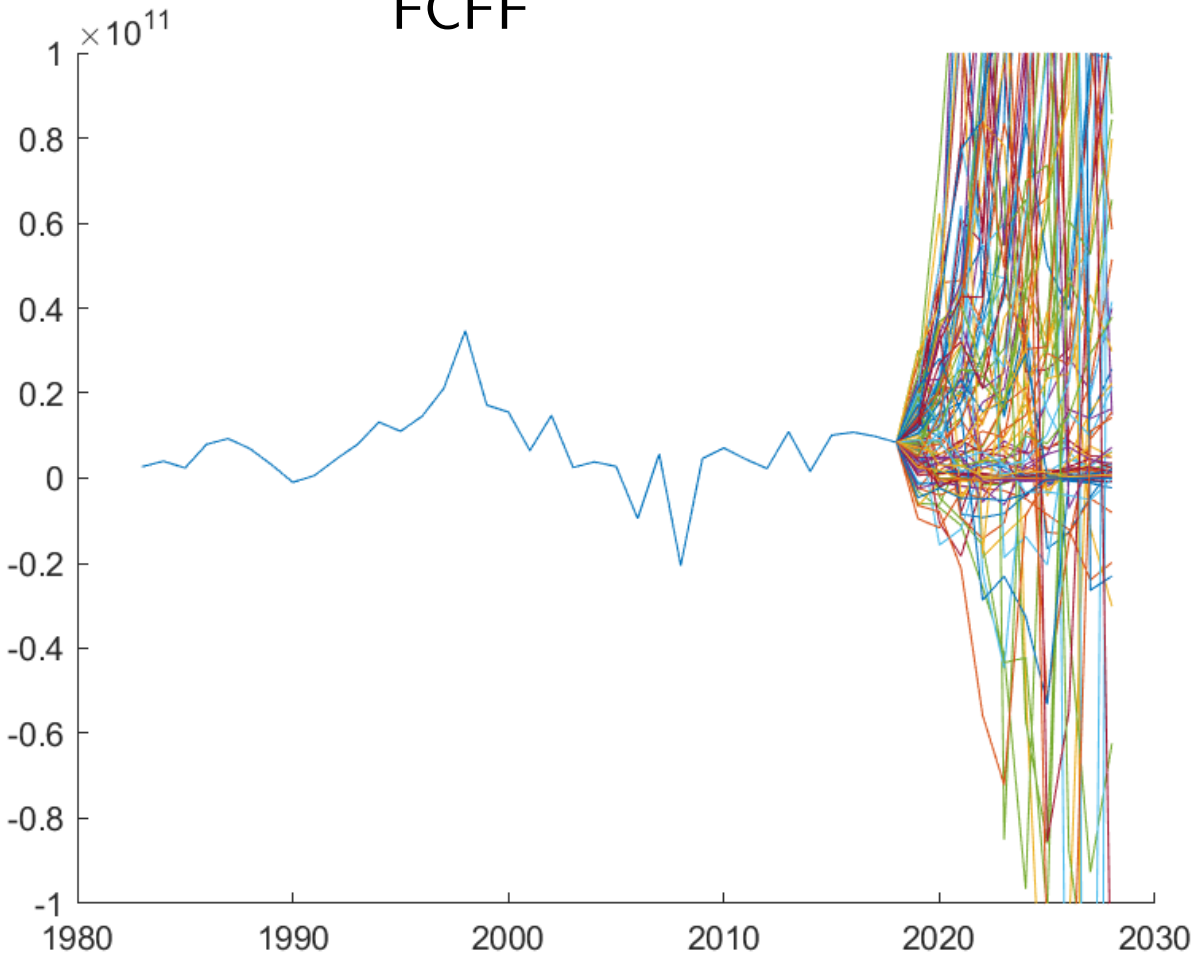
Montecarlo Simulation

Numero simulazioni = 100

Grow Rate



FCFF



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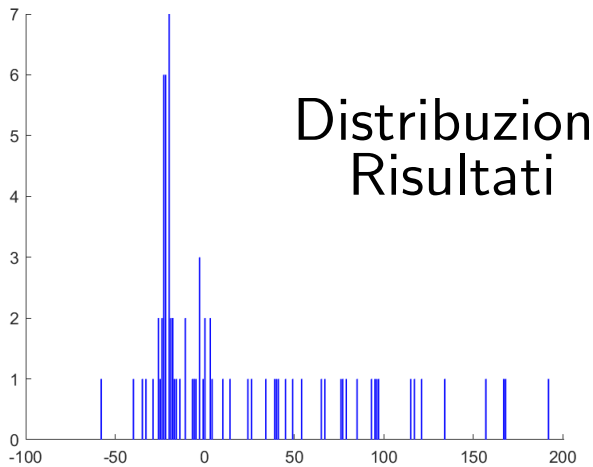
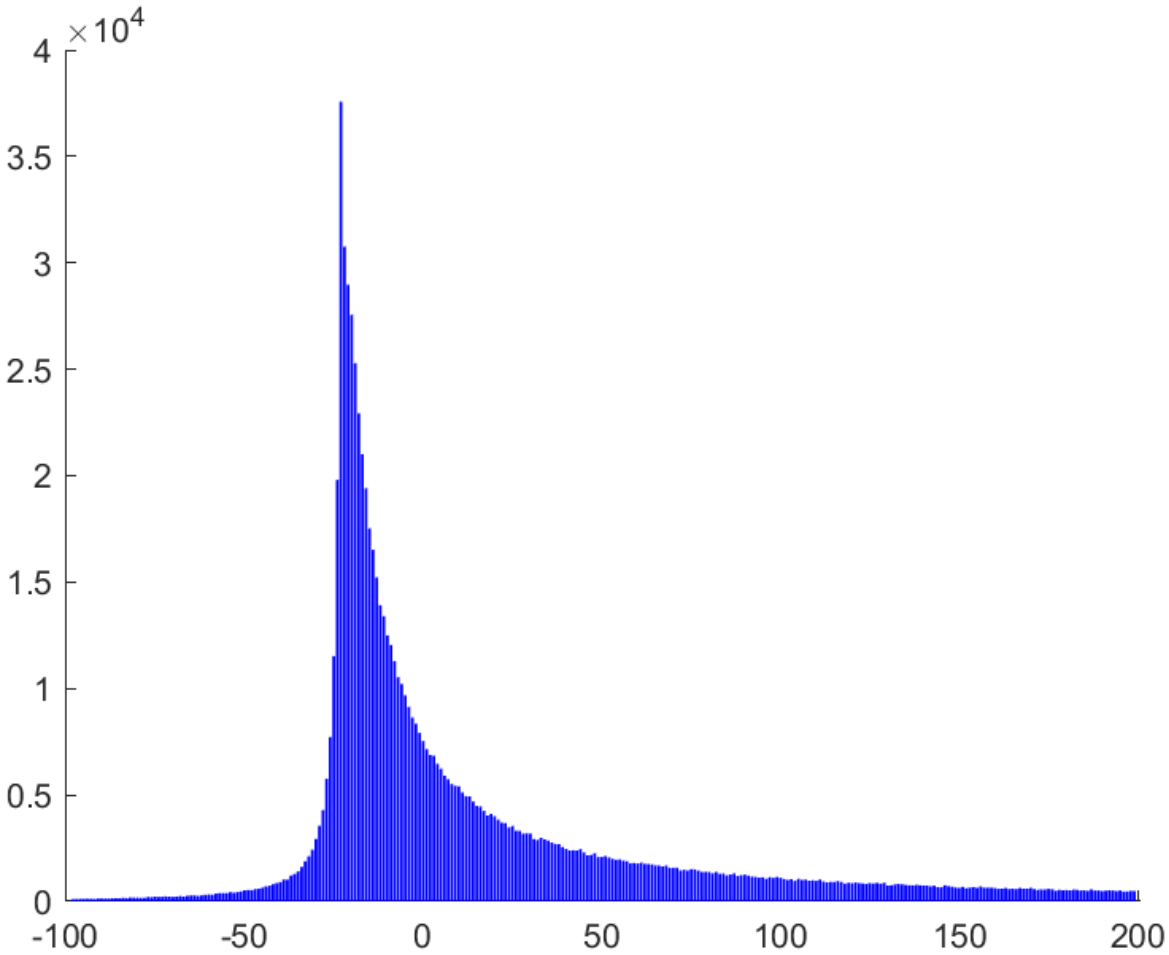


Results and Conclusions

Numero simulazioni = 1'000'000



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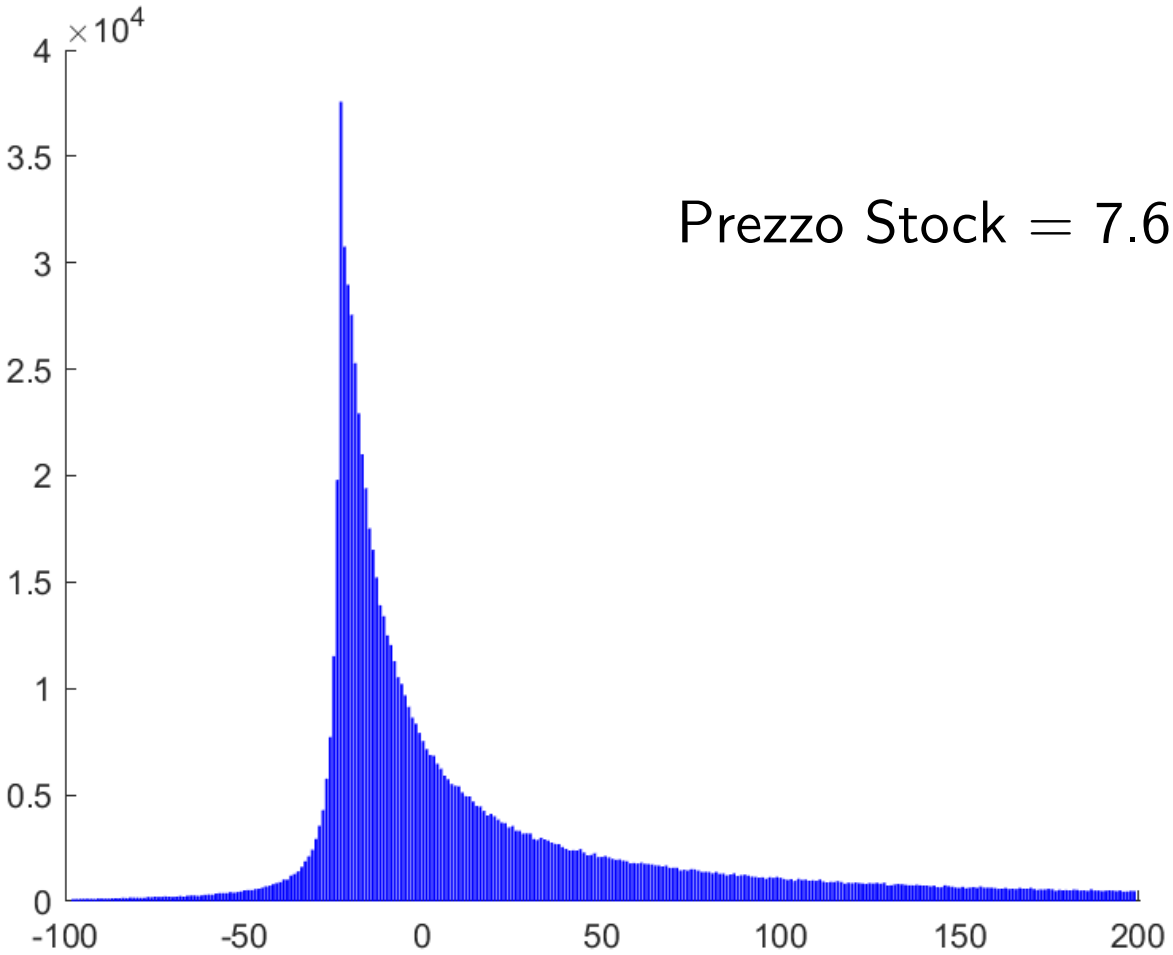

Prezzo Stock = 7.65$ (1 gennaio 2019)

Results and Conclusions

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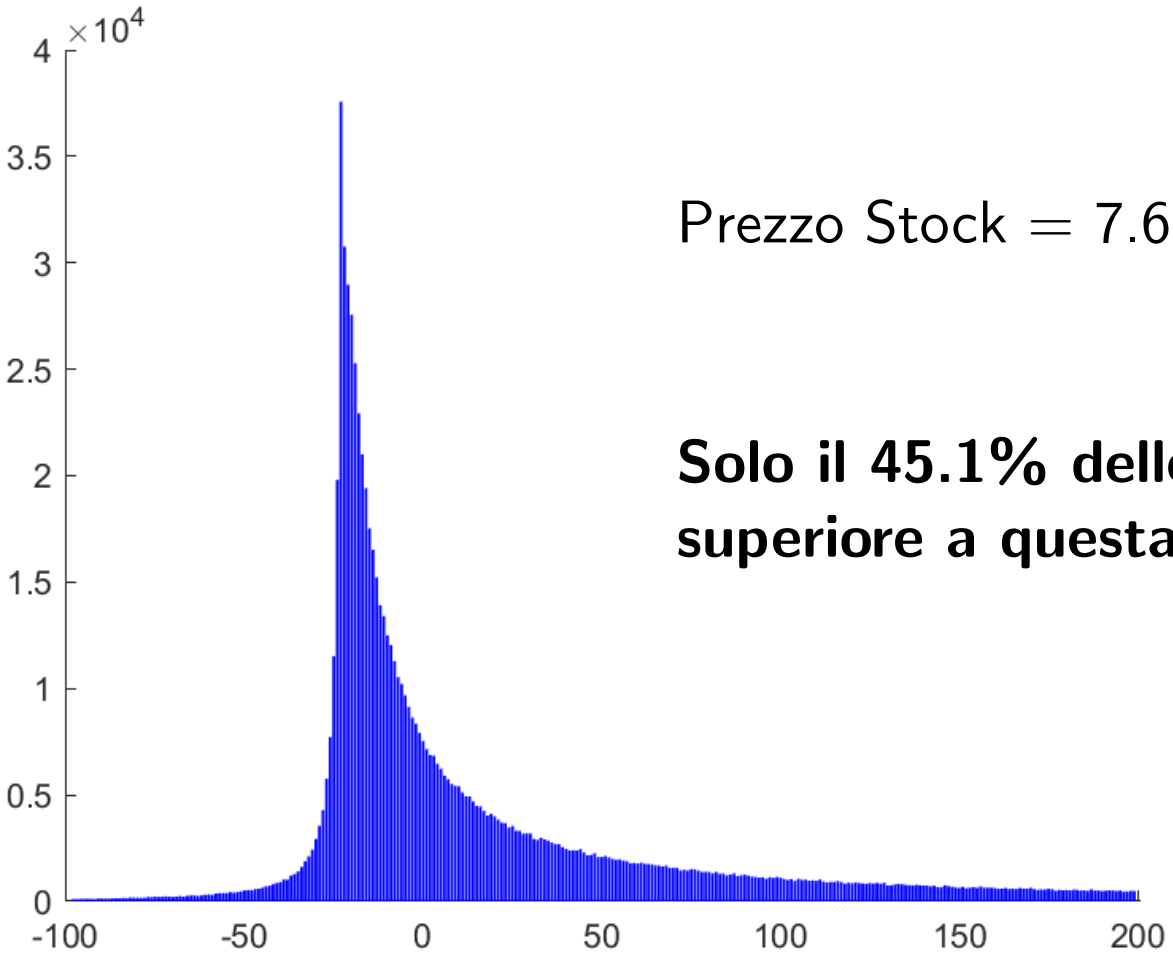

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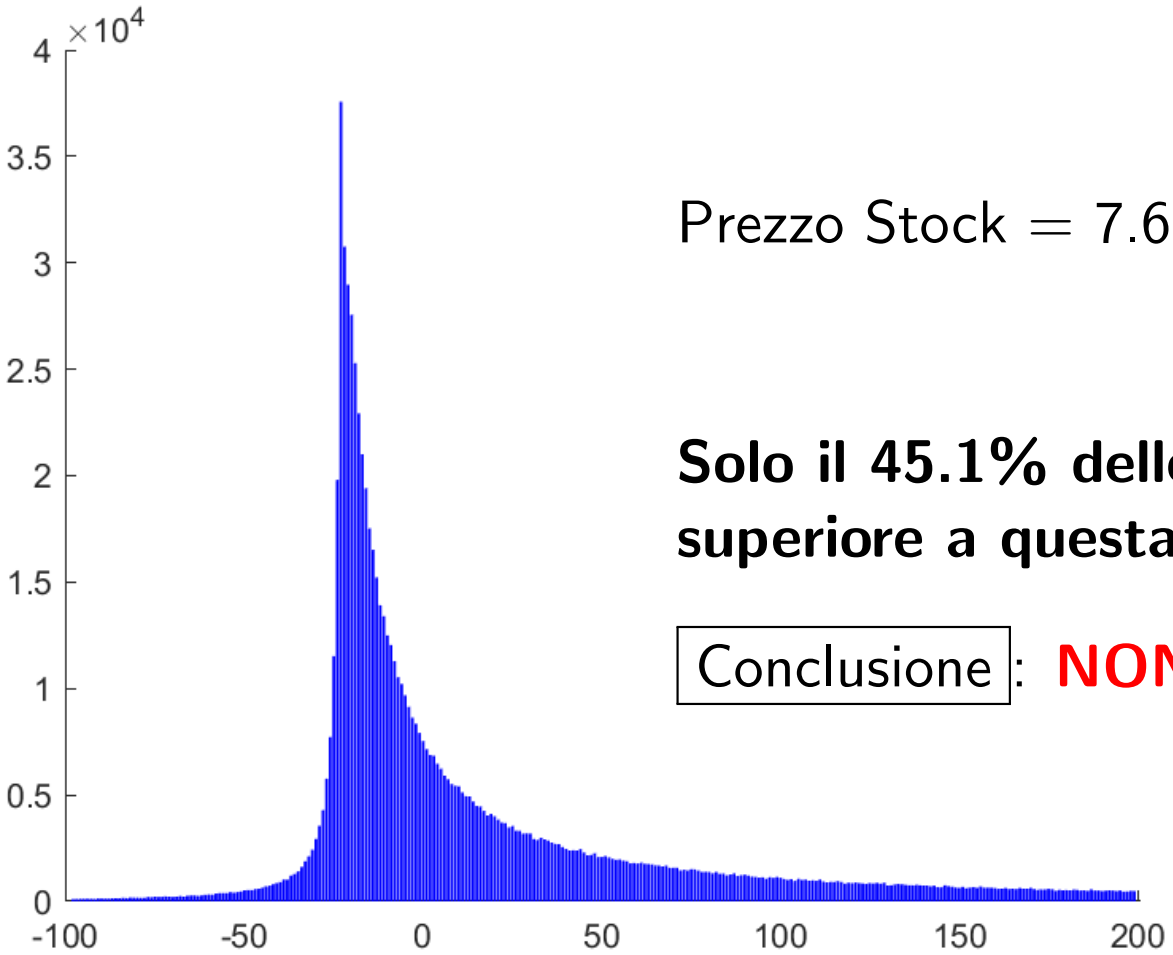
Solo il 45.1% delle simulazioni risulta superiore a questa soglia

Results and Conclusions

Numero simulazioni = 1'000'000



Prezzo Stock = 7.65$ (1 gennaio 2019)

Solo il 45.1% delle simulazioni risulta superiore a questa soglia

Conclusione: **NON COMPRARE**