

# DIVIDEND DISCOUNT MODEL

Financial Mathematics Clinic

SLAS – University of Kent

University of  
**Kent**

Student Learning  
Advisory Service

1 INTRODUCTION

2 GLOSSARY

3 MOTIVATION

4 DDM

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These slides are (mainly) aimed to

- Undergraduate students.
- Postgraduate students doing Financial Mathematics for the first time.

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Objective

- To understand the principles and limitation of the discount dividend model.

1 INTRODUCTION

2 GLOSSARY

3 MOTIVATION

4 DDM

- *Capital Asset Pricing Model (CAPM)*. A financial model for pricing an individual security or portfolio. The CAPM returns the appropriate required return of the asset.
- *Cost of equity*. The return a company pays to its equity investors to compensate for the risk of investing their capital in such company.
- *Perpetuity*. A perpetuity is defined as a series of infinite cash flows.

1 INTRODUCTION

2 GLOSSARY

3 MOTIVATION

4 DDM



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- One of the oldest and more conservative methods for valuing stocks.
- It builds on the principle that a company is worth the sum of its discounted future cash flows.
- It is still part of the curriculum.

1 INTRODUCTION

2 GLOSSARY

3 MOTIVATION

4 DDM

# THEORY AND FORMULATION

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$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots \quad (\textit{perpetuity})$$
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- And what about the company's growth? (Gordon growth model)

$$P_0 = \frac{D_0(1+g)}{(1+r)} + \frac{D_0(1+g)^2}{(1+r)^2} + \frac{D_0(1+g)^3}{(1+r)^3} + \dots \quad (\textit{if } g < r)$$
$$= \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$



## EXAMPLE

Company XYZ declares an annualised dividend of £3 per share for 2021. Which is the fair price of the stock if we assume a constant growth rate of 6% and cost of equity of 13%?

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$$P = \frac{3(1.06)}{.13 - .06} = 45.43$$

## ASSUMPTIONS AND LIMITATIONS (CONT.)

- Loads of assumptions of the company's dividends, the growth rate  $g$ , and the rate of return  $r$  (usually the cost of equity estimated with CAPM).

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- Dividends are not constant nor grow at constant rate (even for reliable companies).
- It is not a robust model ( $g$  cannot be bigger than  $r$ ).
- It is difficult to apply to young companies and to companies not paying dividends.

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- The company has several growth phases.
- However ... there are more assumptions of the company's future to make (how many stages?, when? which growth rates?)

## EXAMPLE

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- Obtain the dividends paid each year and in perpetuity.

	2021	2022	2023	2024	2025+
g	0	.08	.10	.12	.07
D	3	$3(1.08)=3.24$	3.56	3.99	4.27

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- Obtain the present value of the dividends (except the perpetuity).

	2021	2022	2023	2024	2025+
PV		$\frac{3.24}{(1.13)} = 2.88$	2.79	2.76	

## EXAMPLE (CONT.)

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$$\frac{4.27}{.13 - .07} = 71.17$$

- Discount the perpetuity to 2021, i.e.  $71.17(1.13)^{-3} = 49.32$
- Obtain the fair price

$$2.88 + 2.79 + 2.76 + 49.32 = 57.75.$$

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# QUESTIONS?