# A tale of two tribes: Developing the writing skills of financial mathematics students

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# What do PGT Financial Mathematics students need to write?

## Required modules

- Probability Theory (15 credits)
- Risk Neutral Valuation (15 credits)
- MSc Financial Mathematics Project (60 credits)

## Optional modules

- Statistics in Finance (15 credits)
- Stochastic Analysis (15 credits)
- C++ for Financial Mathematics (15 credits)
- Interest Rates and Credit Risk (15 credits)
- Numerical and Computational Methods in Finance (15 credits)
- Elements of Statistical Learning (15 credits)

The two correlated multivariate normal matrices can used in place of their respective Brownian counter parts. One of the defining characteristics of Brownian Motion is that the increments between each point are independent of the next. These increments follow a normal distribution. This means $dW_t = W_{t+\delta t} - W_t = \epsilon_i$. Substituting this into our two stochastic $\mathbb{Q}$-measure equations gives us our simulation equations, where we can write them in the differential counterparts.

$$S_{t+\delta t} = S_t + rS_t\,dt + \sigma_t S_t H\sqrt{\delta t}\epsilon_1 \tag{6}$$

$$\sigma_{t+\delta t} = \sigma_t + a(m(t) - \sigma_t)dt + v(t)H\sqrt{\delta t}\epsilon_2 \tag{7}$$

We can then simulate the log of the stock prices, Z. Ito's lemma produces the following

$$Z_{t+\delta t} = Z_t + (r - \frac{1}{2}\sigma^2)dt + \sigma_t H\sqrt{\delta t}\epsilon_1 \tag{8}$$

Exponentiating this results equation give us our stock prices which allow us to perform different portfolio evaluations [Arm21c].

Several methods were used to assess the value of the portfolio, the first being classic Monte Carlo pricing for our options. This model represents the idea that the price of an option is equivalent to the discounted, expected price of replicating the option in the $\mathbb{Q}$ measure as shown in the equation below.

$$e^{-r(T-t)}\mathbb{E}_{\mathbb{Q}}(\text{payoff}) \tag{9}$$

The trader's portfolio consists simply of call and put options which have respective payoffs:

$$\text{call payoff} = \begin{cases} 0 & S_T \leq K \\ max(S_T - K, 0) & S_T > K \end{cases} \tag{10}$$

$$\text{put payoff} = \begin{cases} max(S_T - K, 0) & S_T < K \\ 0 & S_T \geq K \end{cases} \tag{11}$$

# Academic Tribes & Territories (Becher 1989, 1994)

## Hard Pure

- natural sciences
- eg, physics, maths

## Soft Pure

- humanities & social sciences
- eg, history & anthropology

## Hard Applied

- science-based professions
- eg, mechanical engineering

## Soft Applied

- social professions
- eg, education, management

Biglan (1973)

# Academic Tribes & Territories (Becher 1989, 1994)

**Nature of knowledge**
- cumulative
- atomistic
- concerned with universals, quantities & simplification
- resulting in discovery/explanation

**Nature of disciplinary culture**
- competitive
- politically well-organised
- task-oriented

**Hard Pure**
- natural sciences
- eg, physics, maths

**Soft Pure**
- humanities & social sciences
- eg, history & anthropology

**Hard Applied**
- science-based professions
- eg, mechanical engineering

**Soft Applied**
- social professions
- eg, education, management

**Nature of knowledge**
- functional
- utilarian
- concerned with enhancement of professional practice
- resulting in protocols/procedures

**Nature of disciplinary culture**
- outward-looking
- uncertain in status
- power-oriented

# An awkward initial conversation…

‘the uncomfortable juxtaposition around deficit understandings of students’ language levels’ (Bond 2022, p.123)

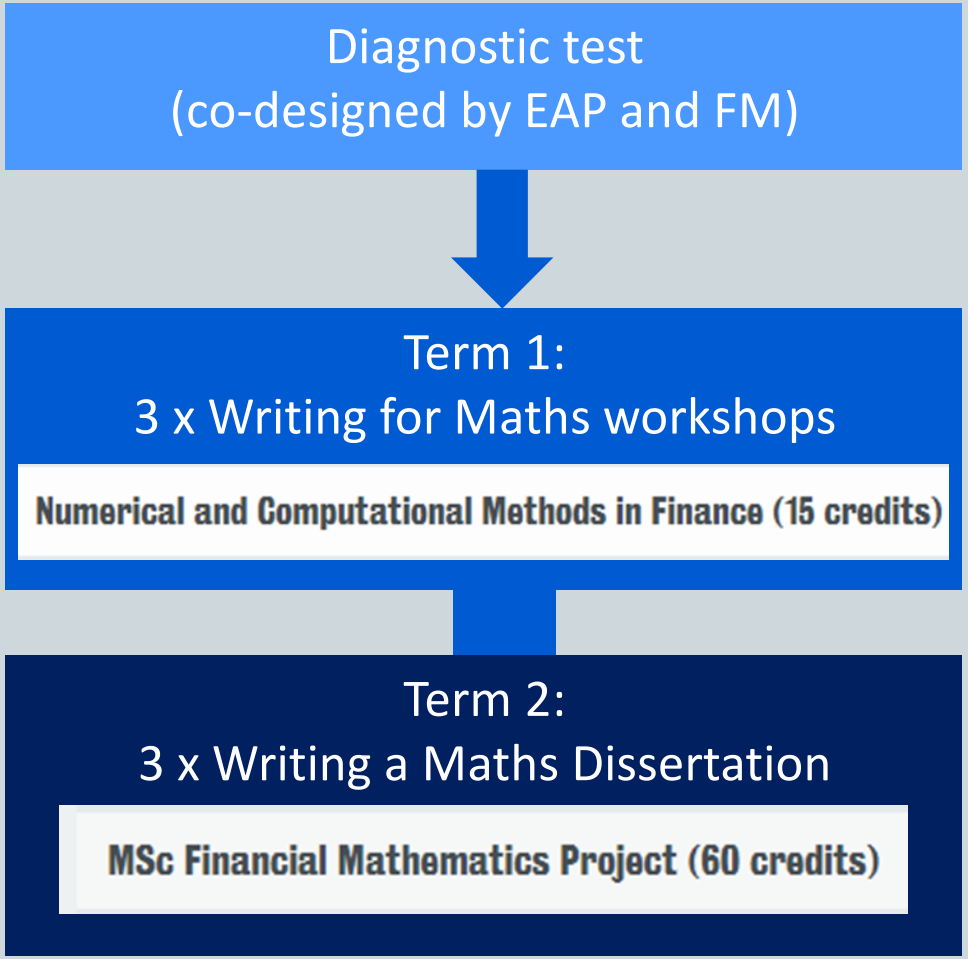
They can’t understand anything when I speak to them…

They can’t speak English…

They must be cheating at IELTS… you should test them again when they arrive at King’s and refund their fees if they don’t pass (External Examiner)

The Pre-sessional makes them worse; they need basic English

# and ‘principled pragmatism’



# To be accepted

Started from a place of confusion.

Confusion about the topic and the text.

Also, communication with faculty was not really happening.

Hence, I went away and studied the topic before meeting John in person.

This was, firstly, to gain acceptance in order to allow communication and, hence, collaboration.

# Collaboration

Now, I was equipped to understand the text to a degree and was able to ask questions.

First, I looked at his writing.

Then, I explained my understanding of the good example.

Hedging Beyond Black-Scholes

He corrected me and answered my questions about his assessment of the text.

Iterative and multi modal leading to materials development.

Also, I was modelling our process to John.

# Impact: Students

## Student feedback: Survey data

**Quantitative**

Students agreed workshops

- had made them more **confident** in writing dissertation (89%)
- had helped them **understand the material** being taught on their course (89%)

**Qualitative**

- usefulness of examples
- understanding expectations of language & structure
- clarity of the sessions

## Student outcomes

**Coursework & Dissertation marks:**

Students with Chinese name who attended writing workshops achieved 10% higher scores than those who didn't. (NB. no correlation with diagnostic test scores.)

**Readiness to submit:**

85% of students who attended writing workshops submitted their dissertation within first 12 months of programme compared to 52% who didn't attend.

Caveats/Limitations:

- small sample size (33)
- not true experimental design (self-selection to writing workshops)
- other factors (time in UK, immersion)

# Other impacts

- Workshops repeated this year and set to continue (funded by Mathematics department)
- Co-writing paper with John Armstrong (senior lecturer / L&T lead in in Mathematics department)
- Case study to be shared by JA with teaching colleagues in maths department
- Increased understanding of needs of students within maths department?
- Increased awareness of academic literacy approaches within maths department?
- Increased confidence in ourselves as effective EAP practitioners

# References


Becher, T. (1989). *Academic Tribes and Territories* Milton Keynes, Open University Press.

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Biglan, A. (1973). The characteristics of subject matter in different academic areas. *Journal of applied Psychology*, *57*(3), 195.

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# Thank you