

CONTEXT

Your first task is to **analyse a network of financial transactions** with the **goal of spotting money laundering**.

Your data contain **all transactions from all the DBBA Bank's customers**. This includes payments, transactions between customers, and money transfers between different accounts (remember that a customer may have more than one account).

QUESTION 1

Describe how you would model the data as a network. Do so by answering the following questions:

- i. What type of network would this be (e.g., single-layer, multipartite, tree, etc.)?
- ii. What do the nodes represent?
- iii. What do the links represent?
- iv. Is the network weighted or unweighted?
- v. Is the network directed or undirected?

Clearly state your assumptions and justify all your answers!

QUESTION 1

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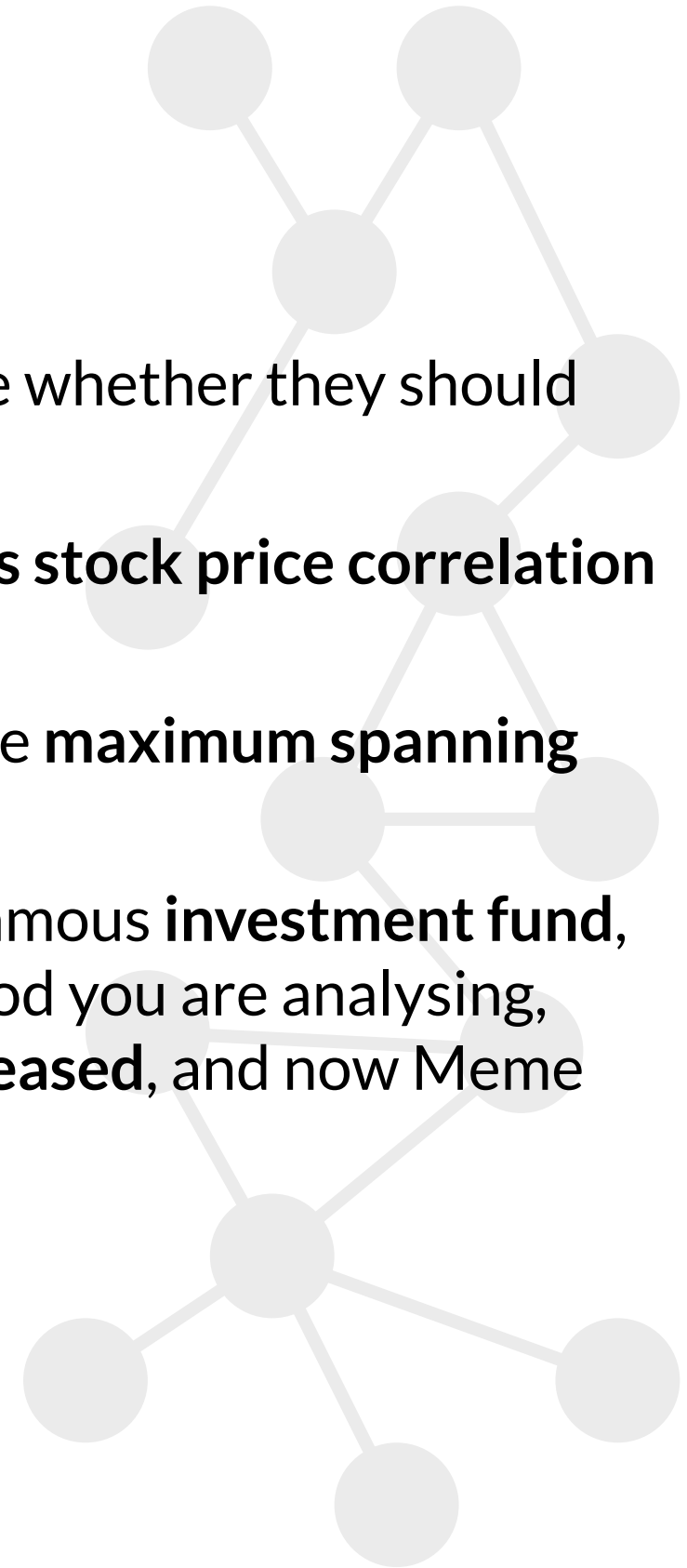
QUESTION 2

Given the current economic turmoil, DBBA Bank wants to explore whether they should **change their asset allocation**.

To do so, you are asked to perform a **temporal analysis of the UK's stock price correlation network**.

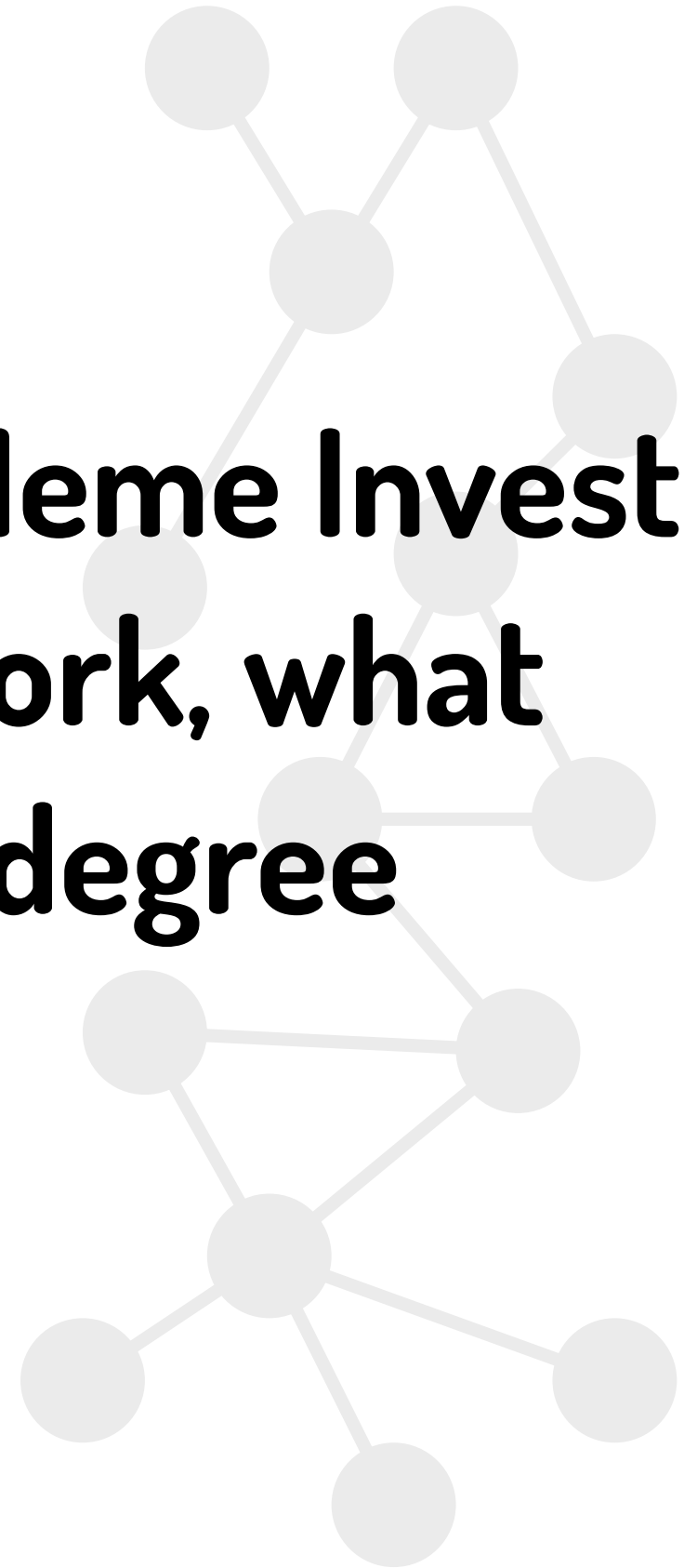
Since you have attended DBBA, you decide to do so by building the **maximum spanning tree of the network for each month of data in the last year**.

While doing your analysis, you notice one thing: Meme Invest, a famous **investment fund**, was the **most central node** in the tree at the beginning of the period you are analysing, forming a **super star**. However, **its degree has progressively decreased**, and now Meme Invest is **not even a hub** anymore.



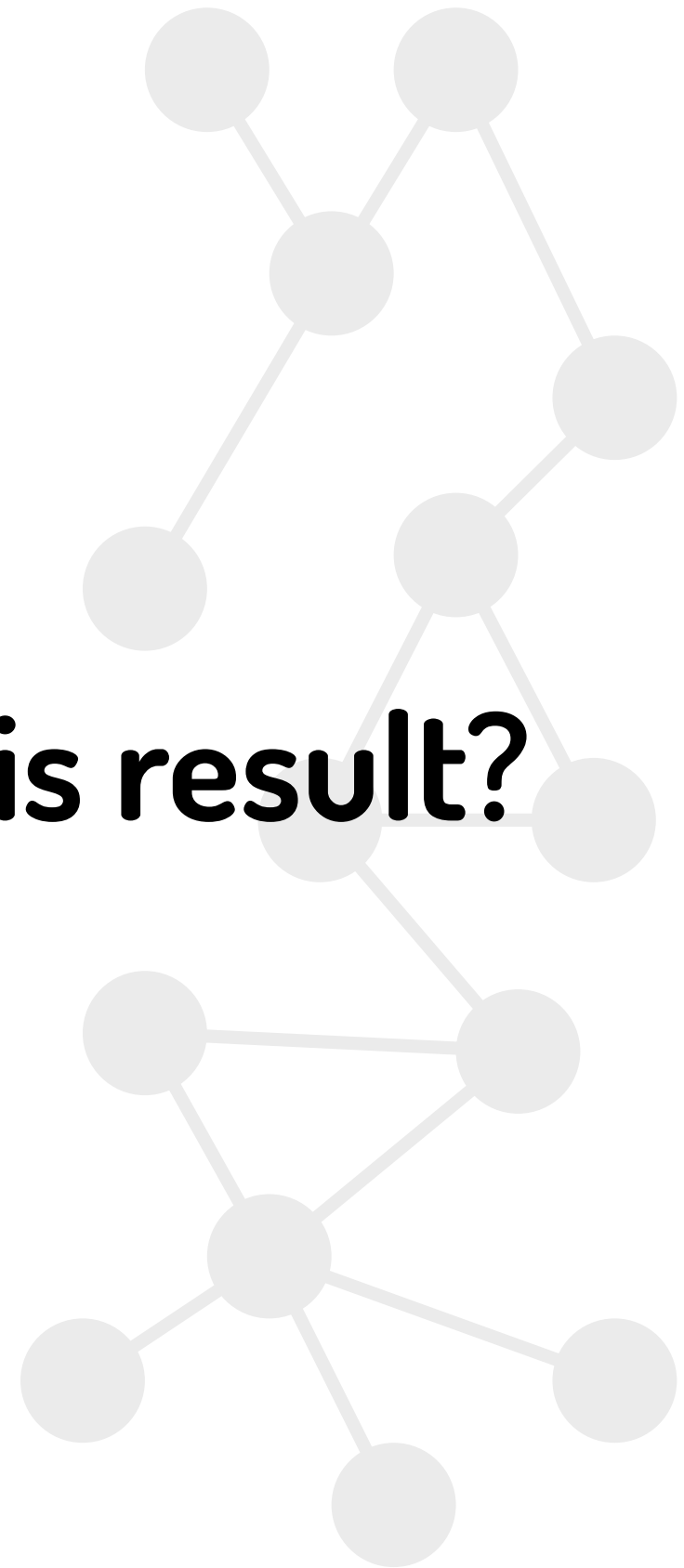
QUESTION 2

Given what you know about Meme Invest and its position in the network, what could be the cause of its degree dropping?



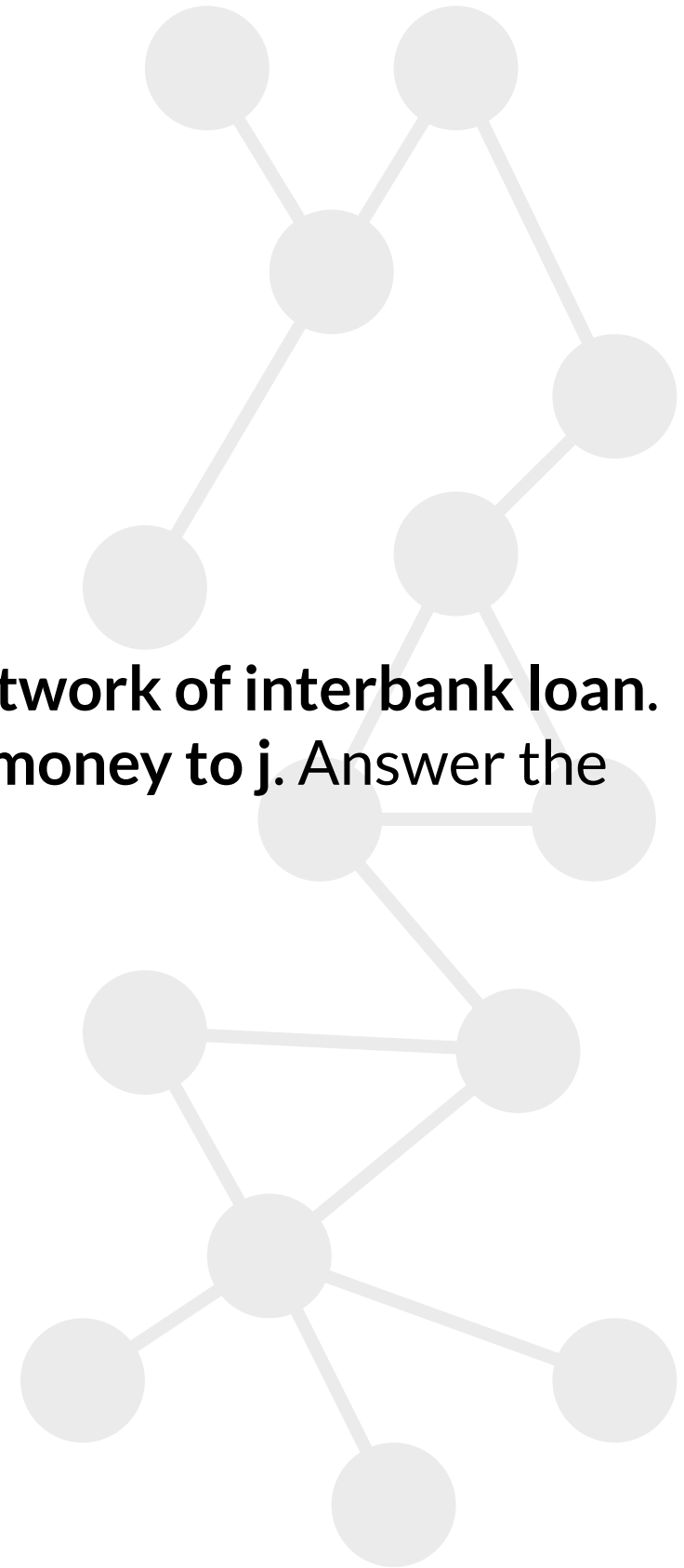
QUESTION 2

How can DBBA Bank use this result?

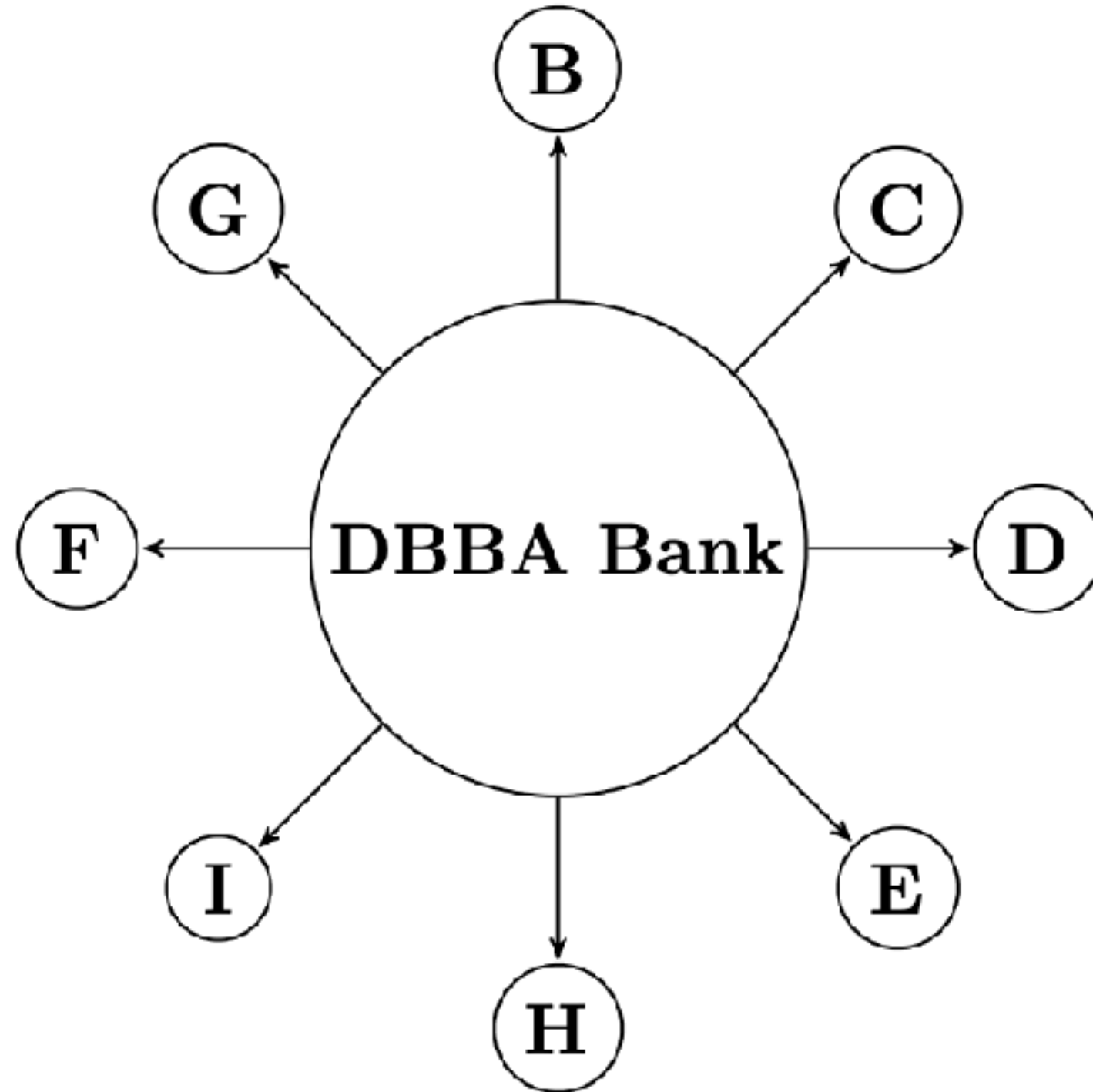


QUESTION 3

The **unweighted, directed** network below is DBBA Bank's **ego-network of interbank loan**. Each node represents a bank. A link from **i to j** means that **i lends money to j**. Answer the following questions:

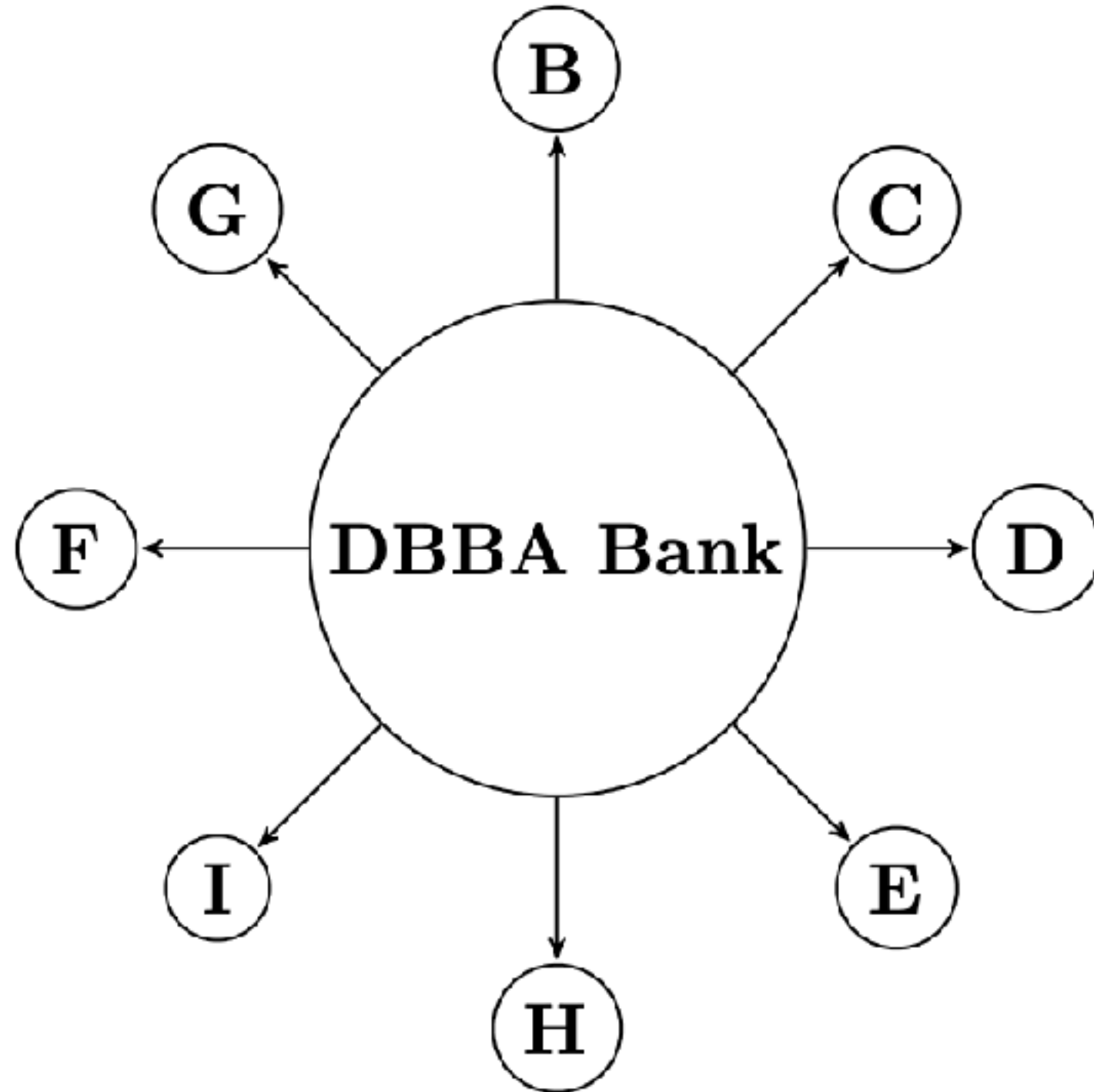


QUESTION 4



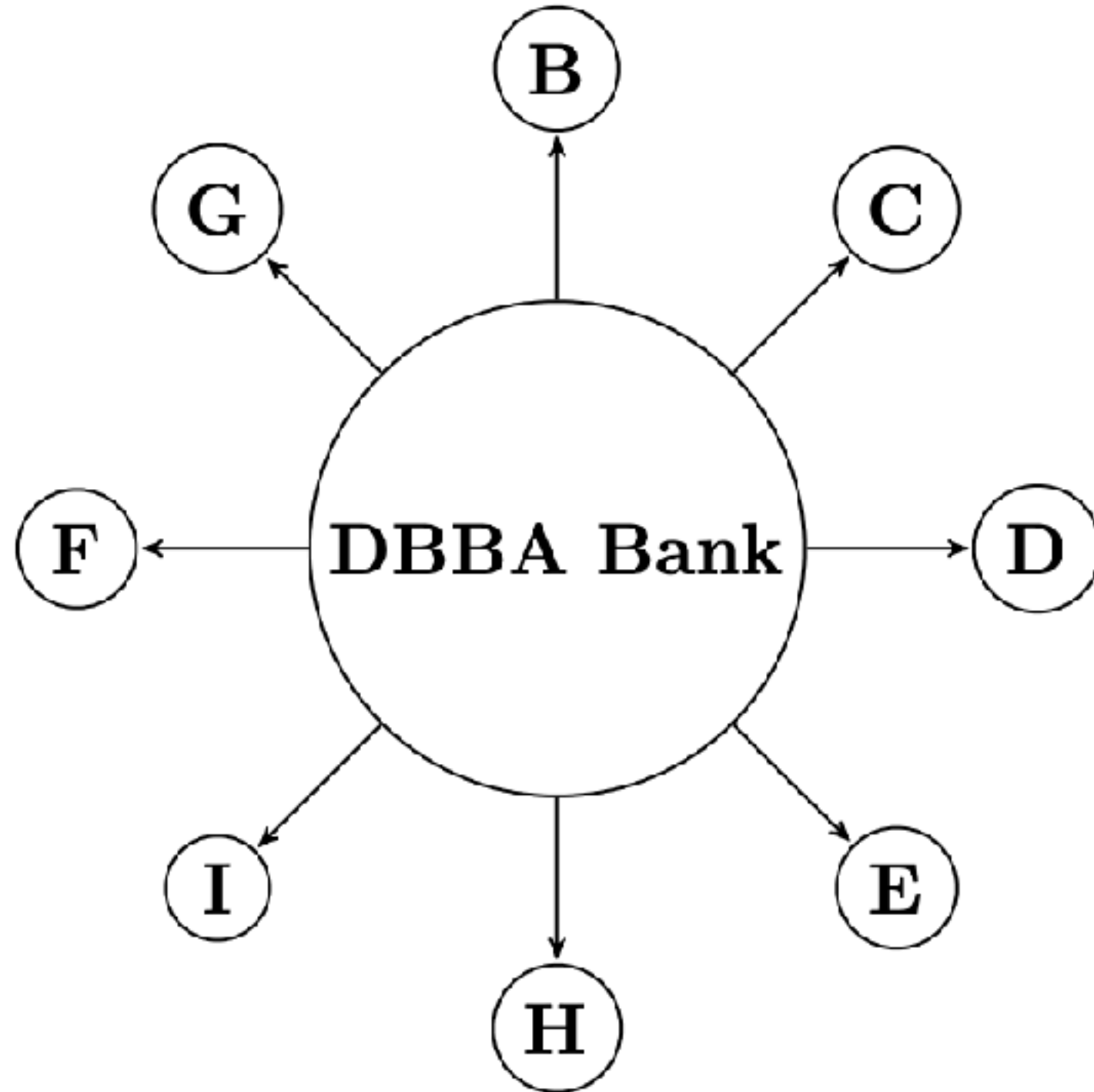
List the nodes that belong to the largest weakly connected component and the nodes that belong to the largest strongly connected component. Justify your answer.

QUESTION 4



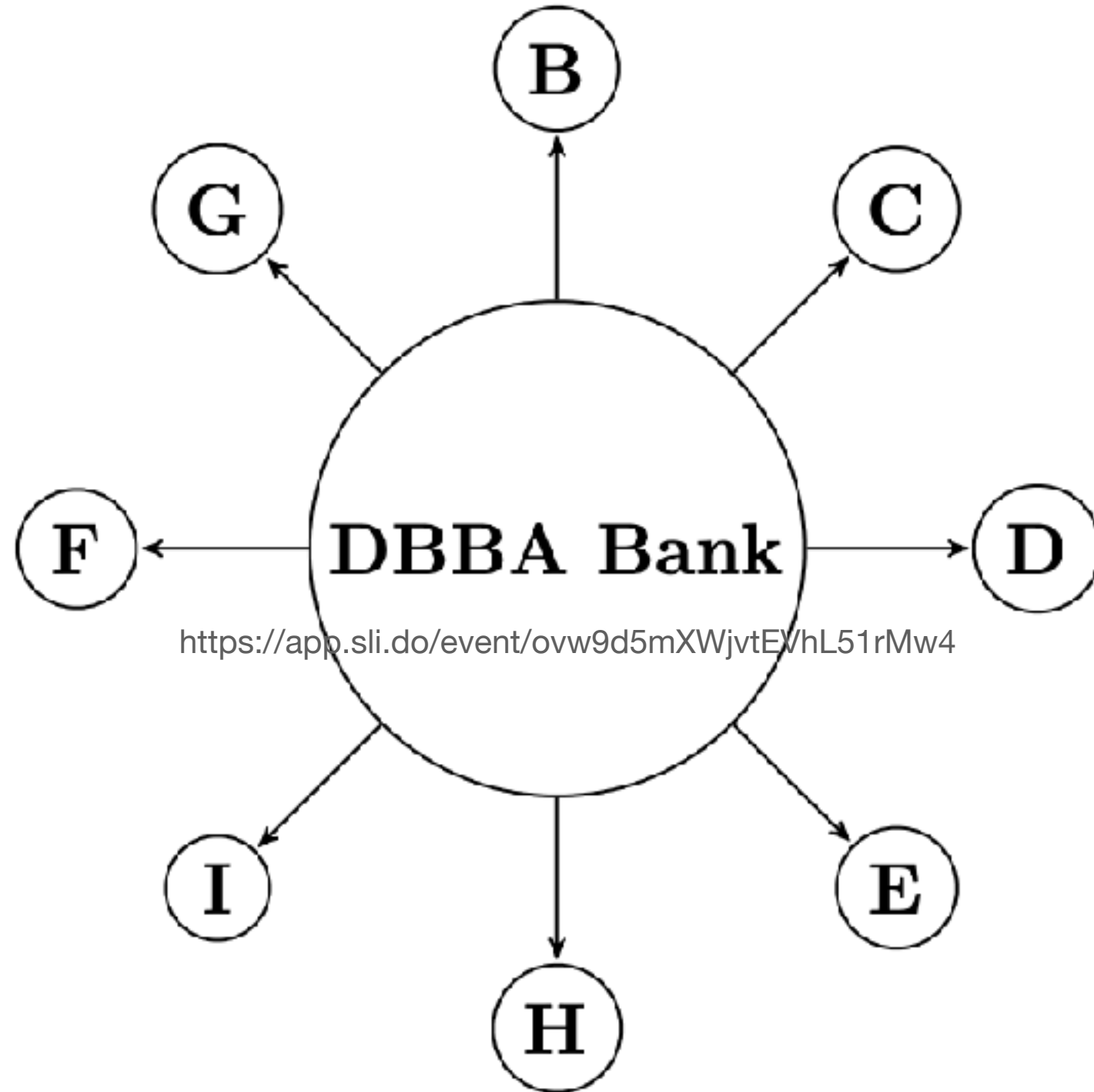
Comment on the centrality of the nodes in the network.

QUESTION 4



Discuss the robustness of the network (maximum five sentences)

QUESTION 4



In case of a systemic shock, which bank would be the most affected?
State your assumptions (if any) and justify your answer.