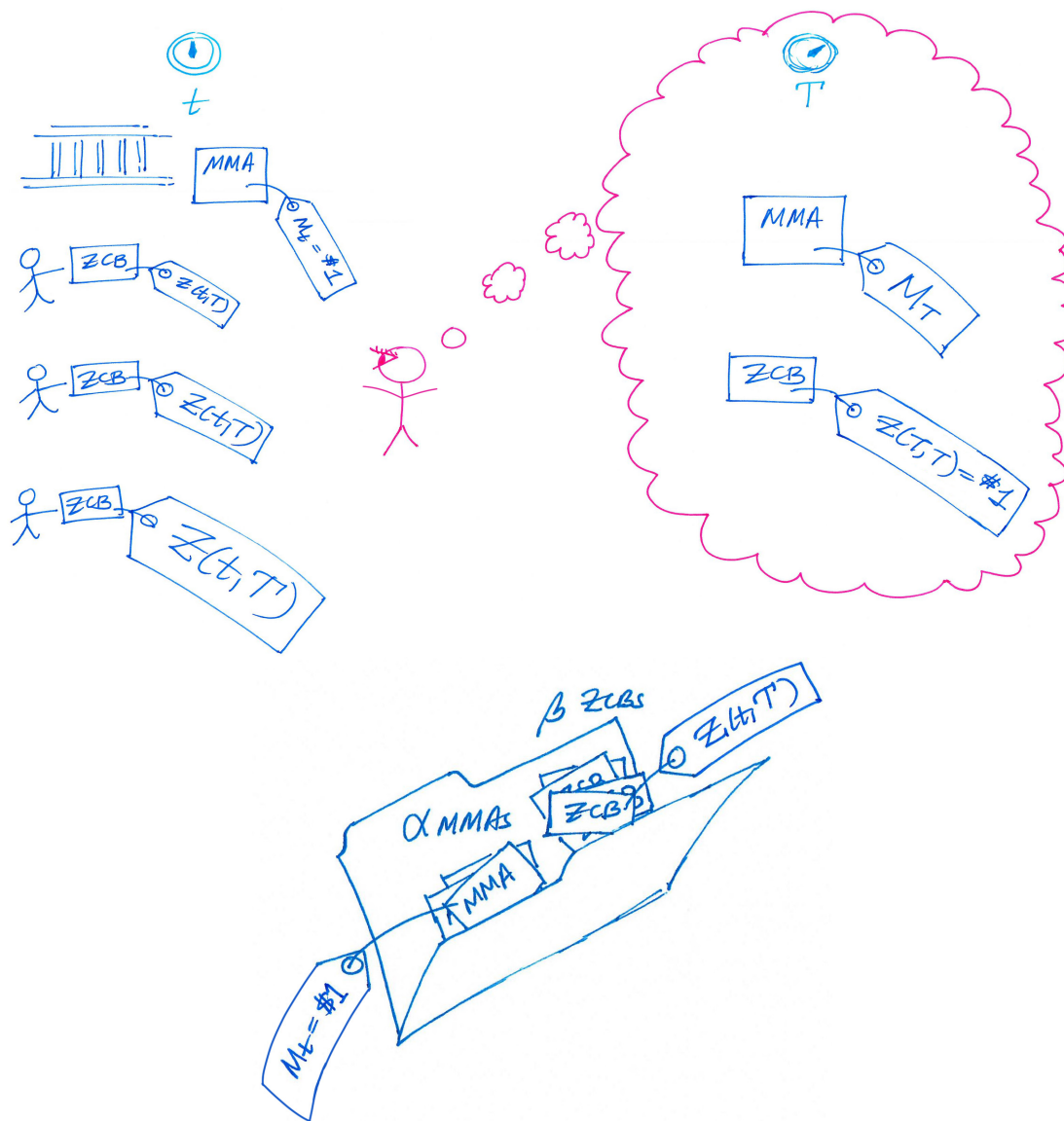


# Exploration (for use in inquiry-based courses): Constructing arbitrage portfolios

**Money market account** – a piece of paper that you pay \$1 for today and which gives you a specified amount of money back at a specified time in the future (e.g. 1 year)

**Zero coupon bond** – a piece of paper that you pay some price for today and which gives you \$1 at a specified time in the future (e.g. 1 year)

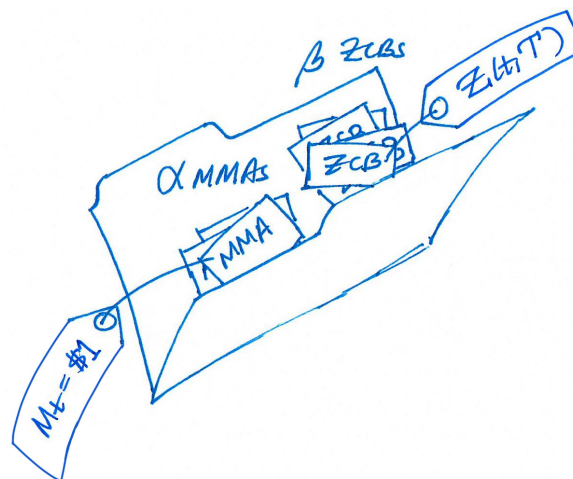


**Arbitrage portfolio** (simplified definition) – an account containing various assets with present total price \$0 but, without any investment, guaranteed positive price at some time in the future (e.g. 1 year from now)

# Exploration (for use in inquiry-based courses): Constructing arbitrage portfolios

## Strategy for “making money from nothing”

	Asset	Price today	Price in 1 year
A	Money market account	\$1.00	\$1.25
B	Money market account	\$1.00	\$1.2
C	Money market account	\$1.00	\$1.1
D	Zero coupon bond	\$0.80	\$1.00
E	Zero coupon bond	$\frac{5}{6}$	\$1.00
F	Zero coupon bond	$\frac{10}{11}$	\$1.00



## Demonstration

Time	Action	Cash	Money market accounts			Zero coupon bonds			Total price of portfolio
			Units	Unit price	Price of total holdings	Units	Unit price	Price of total holdings	
Today	Start out with no assets	\$0	0	\$1	\$0	0		\$0	\$0
	Sell some assets to get cash			\$1					\$0
	Use up cash to buy some assets			\$1					\$0
1 year from now		\$0					\$1		

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### Practice

Fill out the charts below to illustrate at least two additional strategies for “making money from nothing.”

Time	Action	Cash	Money market accounts			Zero coupon bonds			Total price of portfolio
			Units	Unit price	Price of total holdings	Units	Unit price	Price of total holdings	
Today	Start out with no assets	\$0	0	\$1	\$0	0		\$0	\$0
	Sell some assets to get cash			\$1					\$0
	Use up cash to buy some assets			\$1					\$0
1 year from now		\$0					\$1		

Time	Action	Cash	Money market accounts			Zero coupon bonds			Total price of portfolio
			Units	Unit price	Price of total holdings	Units	Unit price	Price of total holdings	
Today	Start out with no assets	\$0	0	\$1	\$0	0		\$0	\$0
	Sell some assets to get cash			\$1					\$0
	Use up cash to buy some assets			\$1					\$0
1 year from now		\$0					\$1		

### Sense-making

Try to develop a simple mathematical condition on asset prices that would ensure that making money for free (starting with \$0 and, without investing money into the portfolio, ending up with positive final price) is not possible.