ATM Sequence UML with Connectivity and Exceptions (No Heartbeat Loop)

User · **ATM Machine** · **Connection Manager** · **Bank Server**

> **ATM Initial Cash:**
> Must be loaded with cash at startup.
> If no cash is available, trigger "ATM Out of Money" early.

> **Withdrawal Limit:**
> Maximum withdrawal is $200 or the available cash,
> whichever is lower.

> **User Input Timer:**
> – 30 sec for card insertion, PIN entry, transaction selection,
>   balance inquiry, and exit.
> – 60 sec for selecting withdrawal amount.

User → ATM Machine: Insert Card

ATM Machine → ATM Machine: Validate Card

alt [Valid Card]
- ATM Machine → User: Prompt for PIN

[Invalid Card]
- ATM Machine → User: Eject Card with invalid card error

User → ATM Machine: Enter PIN

ATM Machine → Connection Manager: establishConnection()

alt [Connection Established]
- Connection Manager → Connection Manager: buildSecureTunnel()

  alt [Secure Tunnel Opened]
  - Connection Manager → Connection Manager: openCommunicationChannel()

    alt [Communication Channel Opened]
    - Connection Manager → ATM Machine: Connection Established

    [Communication Channel Failure]
    - Connection Manager → ATM Machine: Communication Channel Failure Exception
    - ATM Machine → User: Eject Card with Connection Error

  [Secure Tunnel Failure]
  - Connection Manager → ATM Machine: Secure Tunnel Failure Exception
  - ATM Machine → User: Eject Card with Connection Error

[Connection Failure]
- Connection Manager → ATM Machine: Connection Failure Exception
- ATM Machine → User: Eject Card with Connection Error

ATM Machine → Bank Server: Send Card Data + PIN (over secure channel)

Bank Server → Bank Server: Validate PIN

alt [Valid PIN]
- Bank Server → ATM Machine: Return success
- Bank Server → ATM Machine: Return balance
- ATM Machine → User: Show Menu

[Invalid PIN]
- Bank Server → ATM Machine: Return error
- ATM Machine → User: Eject Card with Invalid PIN error
- ATM Machine → Connection Manager: tearDownConnection()

User → ATM Machine: Select Transaction

ATM Machine → User: Show Transaction Options

alt [User selects Withdrawal]
- User → ATM Machine: Request Withdrawal
- ATM Machine → Bank Server: Request Withdrawal
- Bank Server → Bank Server: Check Funds

  alt [Sufficient Funds]
  - ATM Machine → Bank Server: Update Balance
  - Bank Server → ATM Machine: Return success
  - Bank Server → ATM Machine: Dispense Cash
  - ATM Machine → User: Dispense Cash
  - ATM Machine → User: Show Success Message
  - ATM Machine → User: Eject Card
  - User → ATM Machine: Take Cash

  [Insufficient Funds]
  - Bank Server → ATM Machine: Return error
  - ATM Machine → User: Show Insufficient Funds Error

[User selects Balance Inquiry]
- User → ATM Machine: Request Balance
- ATM Machine → Bank Server: Request Balance
- Bank Server → ATM Machine: Return Balance
- ATM Machine → User: Show Balance

alt [User wants to exit]
- ATM Machine → User: Show Exit Message

[User wants to continue]
- ATM Machine → User: Show Menu

ATM Machine → Connection Manager: tearDownConnection()

ATM Machine → User: Eject Card

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