

# Project 5

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## 1 Floating Coupon Bond

The goal of the project is to compute the market value of a portfolio of floating coupon bonds taking into account the issuer credit risk. The input parameters to derive this curve are:

- The par rate of a set of Overnight Index Swaps (i.e. their market quotation)
- A set of forward libor rates and their fixing dates
- A set of survival probabilities and the recovery rate of the issuer
- The static data of the pool of bonds (nominal, start date, end date, current coupon, margin, payment frequency)

Numerical results must be presented to the examining committee during a presentation in which the candidates will also explain the theoretical framework for evaluation of risky flows.

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[3]: from datetime import date
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[11]: today = date(2019, 10, 31)
```

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[12]: libor_tenor = 6
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[13]: ois_quotes = [  
    {'maturity': 1, 'rate': 0.00106},  
    {'maturity': 2, 'rate': 0.00114},  
    {'maturity': 3, 'rate': 0.00115},  
    {'maturity': 4, 'rate': 0.00117},  
    {'maturity': 5, 'rate': 0.00119},  
    {'maturity': 6, 'rate': 0.00121},  
    {'maturity': 7, 'rate': 0.00122},  
    {'maturity': 8, 'rate': 0.00124},  
    {'maturity': 9, 'rate': 0.00128},  
    {'maturity': 10, 'rate': 0.00131},  
    {'maturity': 11, 'rate': 0.00135},  
    {'maturity': 12, 'rate': 0.00138},  
    {'maturity': 15, 'rate': 0.00152},  
    {'maturity': 18, 'rate': 0.00166},  
    {'maturity': 21, 'rate': 0.00184},  
    {'maturity': 24, 'rate': 0.00206},  
    {'maturity': 36, 'rate': 0.00344},  
]
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{'maturity': 48, 'rate': 0.00543},
{'maturity': 60, 'rate': 0.00756},
{'maturity': 72, 'rate': 0.00967},
{'maturity': 84, 'rate': 0.01162},
{'maturity': 96, 'rate': 0.0134},
{'maturity': 108, 'rate': 0.01502},
{'maturity': 120, 'rate': 0.01649},
{'maturity': 132, 'rate': 0.01776},
{'maturity': 144, 'rate': 0.01888},
{'maturity': 180, 'rate': 0.02137},
{'maturity': 240, 'rate': 0.02322},
{'maturity': 300, 'rate': 0.02389},
{'maturity': 360, 'rate': 0.02416},

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]
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[14]: survival_probabilities = [
    {'date': date(2020, 12, 20), 'ndp': 0.972159727015014},
    {'date': date(2021, 12, 20), 'ndp': 0.942926329174406},
    {'date': date(2022, 12, 20), 'ndp': 0.913448056250137},
    {'date': date(2024, 12, 20), 'ndp': 0.855640452819766},
    {'date': date(2029, 12, 20), 'ndp': 0.732687779675469},
    {'date': date(2039, 12, 20), 'ndp': 0.539046016487758},

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]
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[15]: euribor_6m = [
    {'date': date(2019, 10, 31), 'rate': 0.005},
    {'date': date(2020, 4, 30), 'rate': 0.0058},
    {'date': date(2020, 10, 30), 'rate': 0.0066},
    {'date': date(2021, 4, 30), 'rate': 0.0074},
    {'date': date(2021, 10, 30), 'rate': 0.0082},
    {'date': date(2022, 4, 30), 'rate': 0.009},
    {'date': date(2022, 10, 30), 'rate': 0.0098},
    {'date': date(2023, 4, 30), 'rate': 0.0106},
    {'date': date(2023, 10, 30), 'rate': 0.0114},
    {'date': date(2024, 4, 30), 'rate': 0.0122},
    {'date': date(2024, 10, 30), 'rate': 0.013},
    {'date': date(2025, 4, 30), 'rate': 0.0138},
    {'date': date(2025, 10, 30), 'rate': 0.0146},
    {'date': date(2026, 4, 30), 'rate': 0.0154},
    {'date': date(2026, 10, 30), 'rate': 0.0162},
    {'date': date(2027, 4, 30), 'rate': 0.017},
    {'date': date(2027, 10, 30), 'rate': 0.0178},
    {'date': date(2028, 4, 30), 'rate': 0.0186},
    {'date': date(2028, 10, 30), 'rate': 0.0194},
    {'date': date(2029, 4, 30), 'rate': 0.0202},
    {'date': date(2029, 10, 30), 'rate': 0.021},
    {'date': date(2030, 4, 30), 'rate': 0.0218},

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    {'date': date(2030, 10, 30), 'rate': 0.0226},
    {'date': date(2031, 4, 30), 'rate': 0.0234},
    {'date': date(2031, 10, 30), 'rate': 0.0242},
    {'date': date(2032, 4, 30), 'rate': 0.025},
    {'date': date(2032, 10, 30), 'rate': 0.0258},
    {'date': date(2033, 4, 30), 'rate': 0.0266},
    {'date': date(2033, 10, 30), 'rate': 0.0274},
    {'date': date(2034, 4, 30), 'rate': 0.0282},
]

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[16]: bonds_to_price = [
    {'nominal': 4972284.02, 'start_date': date(2016, 3, 1), 'end_date': date(2027, 8, 1),
    'current_coupon': 0.0275, 'margin': 0.0175, 'recovery': 0.2},
    {'nominal': 7344328.27, 'start_date': date(2015, 7, 1), 'end_date': date(2028, 7, 1),
    'current_coupon': 0.0225, 'margin': 0.0175, 'recovery': 0.2},
    {'nominal': 7172290.19, 'start_date': date(2019, 1, 1), 'end_date': date(2023, 9, 1),
    'current_coupon': 0.035, 'margin': 0.01, 'recovery': 0.4},
    {'nominal': 7065224.23, 'start_date': date(2016, 3, 1), 'end_date': date(2020, 10, 1),
    'current_coupon': 0.018, 'margin': 0.01, 'recovery': 0.4},
    {'nominal': 5256452.14, 'start_date': date(2017, 7, 1), 'end_date': date(2022, 4, 1),
    'current_coupon': 0.039, 'margin': 0.01, 'recovery': 0.4},
    {'nominal': 2689680.89, 'start_date': date(2015, 9, 1), 'end_date': date(2030, 7, 1),
    'current_coupon': 0.032, 'margin': 0.01, 'recovery': 0.6},
    {'nominal': 3593518.71, 'start_date': date(2016, 7, 1), 'end_date': date(2025, 2, 1),
    'current_coupon': 0.032, 'margin': 0.01, 'recovery': 0.6},
    {'nominal': 6993589.53, 'start_date': date(2017, 1, 1), 'end_date': date(2024, 11, 1),
    'current_coupon': 0.021, 'margin': 0.01, 'recovery': 0.6},
    {'nominal': 6684377.52, 'start_date': date(2015, 9, 1), 'end_date': date(2027, 9, 1),
    'current_coupon': 0.019, 'margin': 0.01, 'recovery': 0.6},
    {'nominal': 6896199.04, 'start_date': date(2016, 7, 1), 'end_date': date(2024, 11, 1),
    'current_coupon': 0.0235, 'margin': 0.0135, 'recovery': 0.4},
    {'nominal': 2587984.6, 'start_date': date(2017, 10, 1), 'end_date': date(2026, 10, 1),
    'current_coupon': 0.016, 'margin': 0.01, 'recovery': 0.4},
    {'nominal': 3621656.1, 'start_date': date(2018, 6, 1), 'end_date': date(2022, 7, 1),

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        'current_coupon': 0.0325, 'margin': 0.0135, 'recovery': 0.4},
        {'nominal': 3146567.47, 'start_date': date(2017, 6, 1), 'end_date':
→date(2028, 3, 1),
        'current_coupon': 0.019, 'margin': 0.009, 'recovery': 0.2},
        {'nominal': 6452721.61, 'start_date': date(2015, 4, 1), 'end_date':
→date(2025, 4, 1),
        'current_coupon': 0.029, 'margin': 0.009, 'recovery': 0.2},
        {'nominal': 3418346.24, 'start_date': date(2016, 5, 1), 'end_date':
→date(2022, 1, 1),
        'current_coupon': 0.026, 'margin': 0.009, 'recovery': 0.2},
]

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