Macroeconomic default modelling and stress testing

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Introduction

- How to model the relation between the macro economy and the default rate?

- What macroeconomic variables are related to default behaviour of firms?

- Scenario analysis of the default behaviour of firms for a base scenario with no assumptions and a scenario with a two quarter zero GDP growth

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Aggregate default modelling

$pd_t = g(\theta, z_t, v_t)$

- pd_t : fraction of firms that defaults in period t
- θ : parameter vector
- z_t : explanatory variables
- v_t : disturbance

- No firm specific variables
- Estimation with Maximizing Likelihood
- Distribution of pd_t controlled by distribution of v_t

$$\tilde{pd}_{t,i} = \boldsymbol{\beta}_{i,0} + \boldsymbol{\beta}_{i,1}\tilde{pd}_{t-1,i} + \boldsymbol{\beta}_i^{*\prime} \boldsymbol{z}_{t-1}^* + v_{t,i}$$

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Macro variables

Literature on non stock exchange traded firms:

	Positively related	Negatively related
GDP growth		X
Interest rates	X	
Exchange rates	X	

Literature on stock exchange traded firms:

	Positively related	Negatively related
GDP growth		X
Interest rates	X	
Stock market return		X
Stock market volatility	X	

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GDP growth

The economy is always at risk of slowing down

	GDP growth
Ind., min.	−2.41***
Construction	−.99
Trade, rep. cons.	−1.15*
Catering	−.43
Trans., stor., com.	−3.45***
Financial	−3.08***
Rental, corp.	−2.93***
Other	−.51
Economy	−1.33**
Pooled	−1.69***
(P-value equal coefficients	.0694)

Declining GDP

↕

Declining aggregate demand

↕

Lower sales

↕

Default

Interest rates

Over the next years, a decline in the saving rate caused by aging is likely to boost interest rates

	Short rate	Δ Short rate
Ind., min.	1.11*	−3.84
Construction	1.88***	−2.69
Trade, rep. cons.	.76	−.71
Catering	−.47	1.04
Trans., stor., com.	−.44	.88
Financial	.08	2.79
Rental, corp.	1.10	−1.47
Other	−.11	−5.54
Economy	.79	.66
Pooled	.86	−1.60
(P-value equal coefficients	.0025	.2829)

Rising Interest rates

↕

Rising cost of debt

↕

Default

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Exchange rate

E.g. the possibility of a depreciation of the USD.

Sign is ambiguous

- Importing firms depend positively on exchange rate
- Exporting firms depend negatively on exchange rate

	ln(ER)	Δ ln(ER)
Ind., min.	.45*	.14
Construction	.15	.75
Trade, rep. cons.	.63**	.13
Catering	.67*	.59
Trans., stor., com.	1.75***	$-$.72
Financial	.99**	$-$.03
Rental, corp.	.61**	.15
Other	$-$.26	.65
Economy	.42*	.12
Pooled	.48**	.21
(P-value equal coefficients	.0000	.9172)

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Stock market

Stock market crashes: High impact, low probability

	Return	Volatility
Ind., min.	−.01	1.19
Construction	.27	2.05
Trade, rep. cons.	.16	.95
Catering	.04	−4.70
Trans., stor., com.	.07	1.87
Financial	−.15	3.31
Rental, corp.	−.23	−.51
Other	−.15	−3.73
Economy	−.03	1.23
Pooled	.02	.97
(P-value equal coefficients	.0298	.1443)

- Pd negatively related to stock return
- Pd positively related to volatility

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Oil Price

Concern about a rising oil price

Rising Oil Price

$\updownarrow$

Rising Cost

$\updownarrow$

Default

	ln(Oil price)	Δ ln(Oil price)
Ind., min.	.10**	−.09
Construction	.07	−.05
Trade, rep. cons.	.11***	−.15
Catering	.19***	−.22*
Trans., stor., com.	.21***	−.08
Financial	.15**	−.04
Rental, corp.	.10**	−.06
Other	.08	−.02
Economy	.07*	−.06
Pooled	.10***	−.10
(P-value equal coefficients	.1972	.5630)

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Scenario analysis

Comparison of average simulated paths of default rates in 2007:

- Base scenario: no assumptions
- Worst case scenario: 2.5% worst cases of base scenario
- GDP growth scenario: assume zero growth in two quarters 2006.3 and 2006.4

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Scenario results
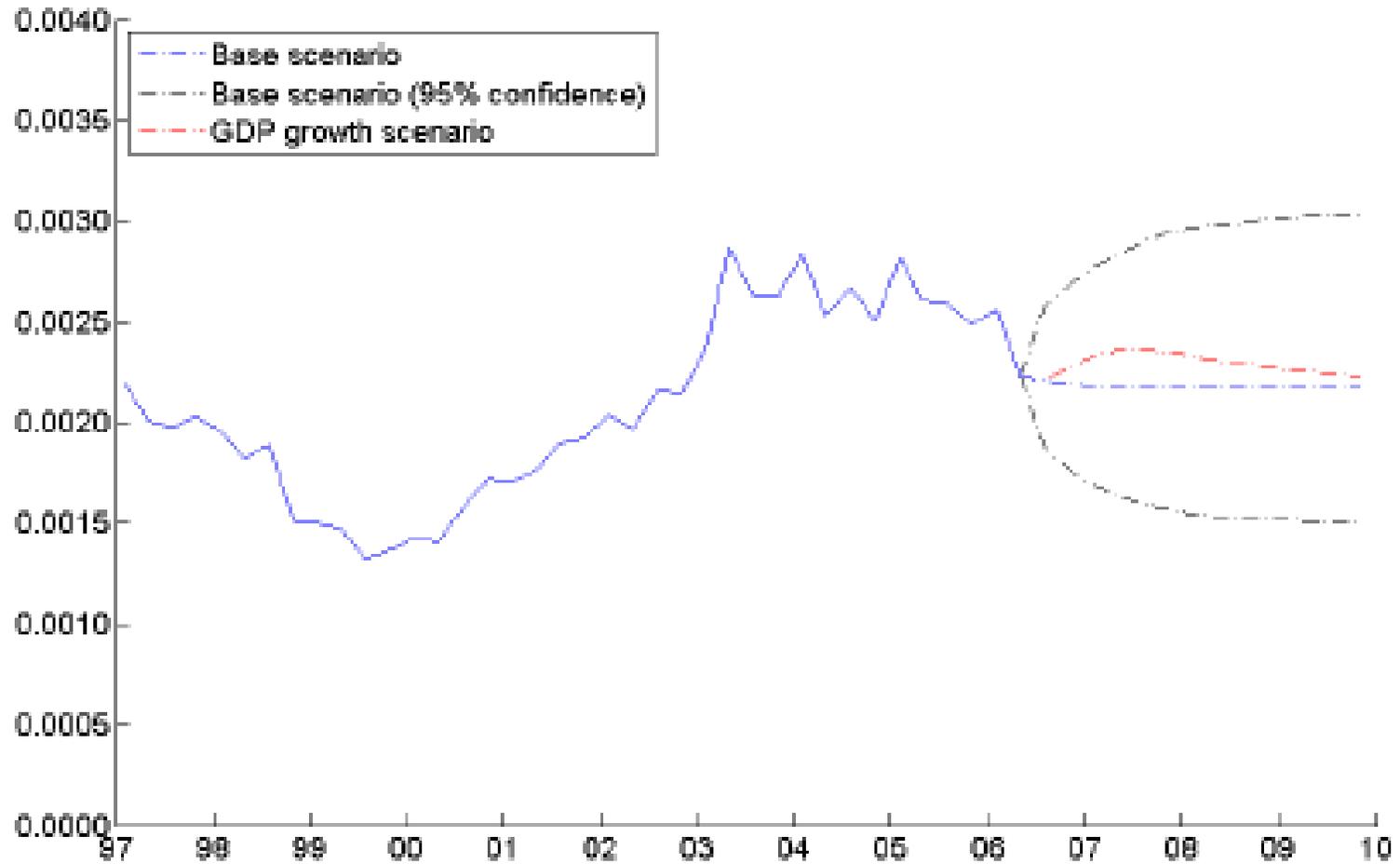
Historic GDP and default
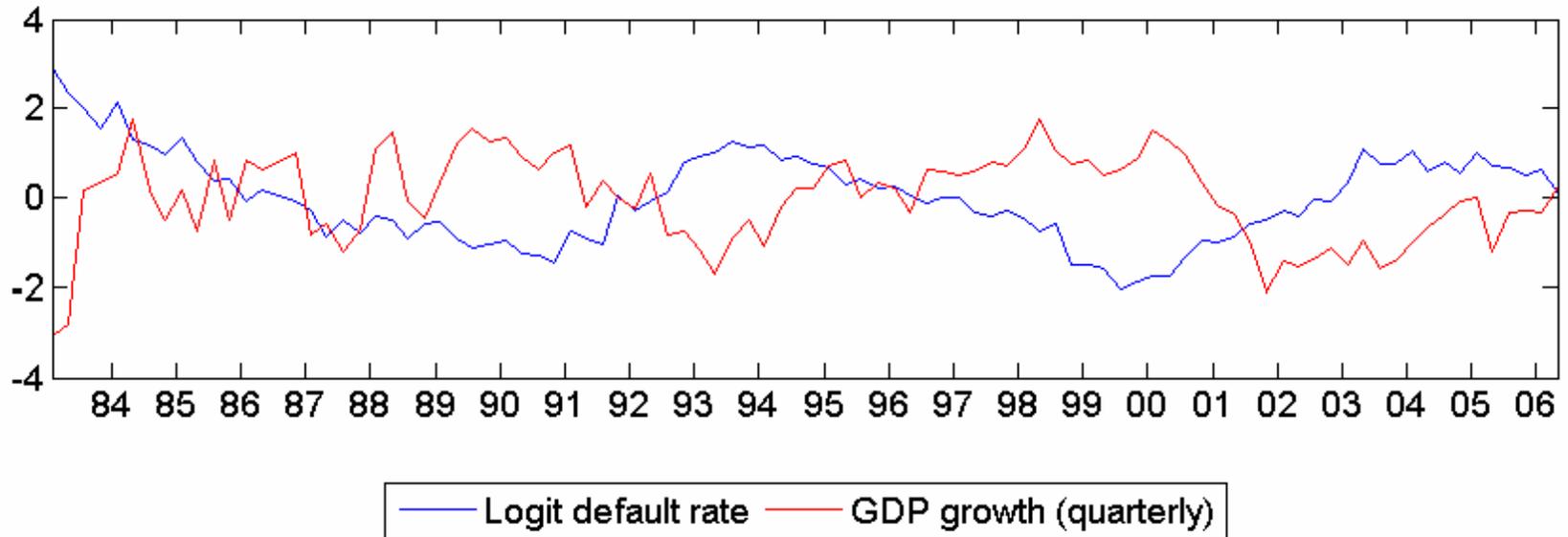
Conclusions

- What macroeconomic variables are related to default behaviour of Dutch firms?
  - Significant: GDP growth, Oil price
  - Some significance: interest rate, exchange rate
  - Insignificant: Stock market return and volatility

- What is the default behaviour of Dutch firms given a two quarter zero GDP growth and a 2.5% worst case scenario?
  - The 2.5% worst case scenarios lead to a great rise in the default rate
  - The default rate does barely react to short recessions
  - Does this suggest that a scenario of two quarter zero GDP growth underestimates risk?

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