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CENTER *for* COMMUNITY CAPITAL
Research and analysis on the transformative power of capital

Mortgage Default and Local Unemployment

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Summary of Presentation

- Background and research questions
- Empirical issues and strategies
- Findings and implications (a few examples)



Background

- Recent crisis has renewed interest in mortgage termination risks
- The role of unemployment in mortgage default
- Relatively lack of understanding of economic (business) cycles and mortgage performance



Business Cycle and Unemployment

$$y_t = c_t + \tau_t$$

- $y \rightarrow$ level of unemployment rate
- $c \rightarrow$ transitory (temporary, short run/term, cyclical) component
- $t \rightarrow$ permanent (structural, long run/term, trend) component



Research Questions

- Does economic cycle theory influence mortgage performance through unemployment
- Do long and short term unemployment influence how risk factors determine mortgage terminations in different ways.



Empirical strategies

- Identify short and long term unemployment rates
 - Identification method depends on whether unemployment series are stationary (practically)
 - US and most county series aren't (their first differences mostly are)
 - 540 counties (unemployment rate series)
- Estimate model using hazard analysis
- Simulate termination probabilities



Hodrick-Prescott (HP) Filter (1997)

- A smoothed-curve representation of a time series of the level of unemployment. Consistent with prior work, we select 129,600 as the smoothing parameter.

$$\min_{\{\tau_t\}} \left\{ \sum_t c_t^2 + K \sum_t [(\tau_t - \tau_{t-1}) - (\tau_{t-1} - \tau_{t-2})]^2 \right\}$$

- Easy to implement
- May not be ideal for forecasting purposes
- Past states change after revision



Beveridge and Nelson (BN) Decomposition (1981)

- Based on a long run forecast of unemployment. The estimated trend is a random walk with drift that accounts for growth.

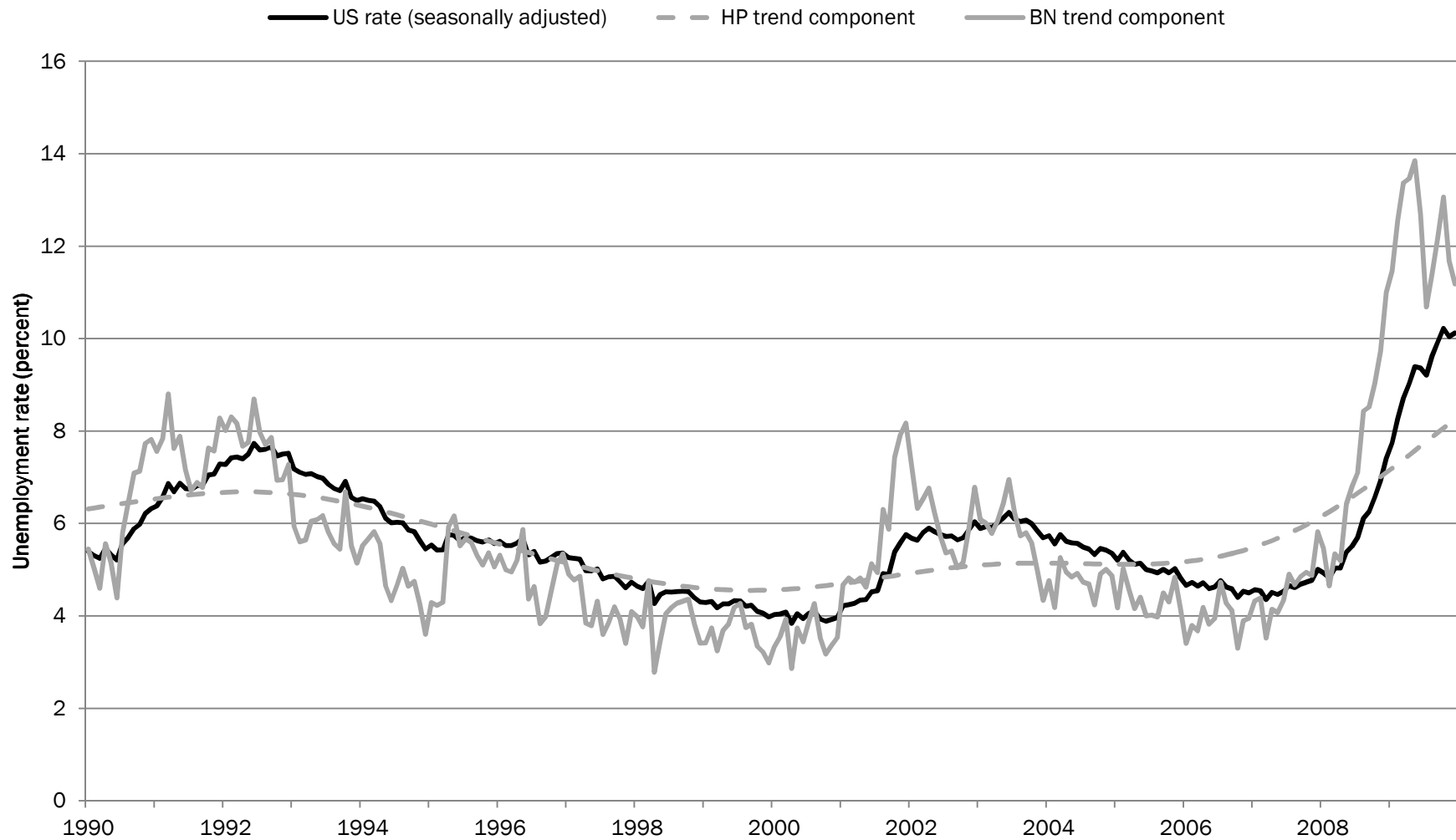
$$w_t = \mu + \varepsilon_t + \phi_1 \varepsilon_{t-1} + \dots \quad \tau_t = y + \left(\sum_1^{\infty} \phi_i \right) \varepsilon_t + \left(\sum_2^{\infty} \phi_i \right) \varepsilon_{t-1} + \dots$$

- Better forecasting capabilities but requires correct specifications, Newbold (1990)

$$c_t = \sum_{j=1}^q (\hat{w}_t(j) - \bar{w}) + \left(1 - \sum_1^p \phi_i \right)^{-1} \sum_{j=1}^p \sum_{i=j}^p [\phi_i (\hat{w}_t(q - j + 1) - \bar{w})]$$



US Unemp. Rate Level and Trends





Hazard Analysis

- Mortgage performance estimated using Competing Risk, Proportional Hazard Analysis (Pennington-Cross and Ho 2010).

$$\lambda_i^r(t | X_i(t), \theta_D, \theta_P) = \exp(\lambda_0^r(t) + X_i(t) * \beta_r + \theta_r)$$

$$S_i(t | X_i(t), \theta_D, \theta_P)$$

$$= \exp\left(-\int_0^t [\lambda_i^D(s | X_i(t), \theta_D, \theta_P) + \lambda_i^P(s | X_i(t), \theta_D, \theta_P)] ds\right)$$

- Loan data: CRA loans



Summary Statistics

	Variable	Subcategory	Mean	Std dev
Constant within each loan	inc_ami		0.589	0.158
	dti		0.275	0.074
	fico		678	64
	Loans		22,538	

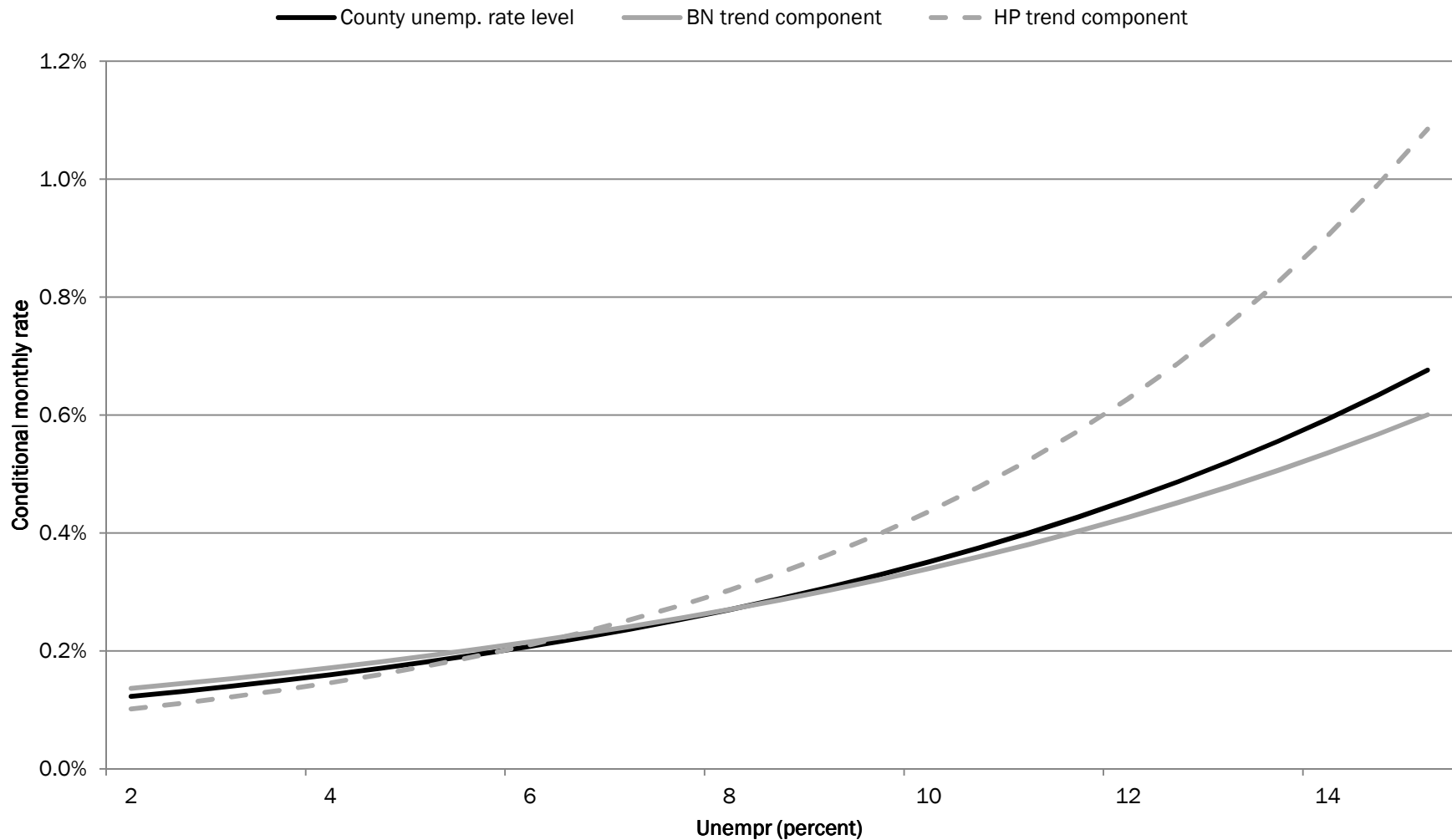


Summary Statistics

	Variable	Subcategory	Mean	Std dev	
Varies within each loan	cltv		0.788	0.150	
	refi		-0.122	0.102	
	unempr	Level	5.430	1.814	
		Cyclical HP	0.001	0.994	
		Cyclical BN	0.006	0.864	
		Trend HP	5.429	1.530	
		Trend BN	5.436	2.186	
		TTRO	62147	29999	
		varmrate		1.5E-05	1.1E-05
		varhpi		2.2E-05	4.1E-05
		loan age		45	28
		Observations (monthly)		968,561	

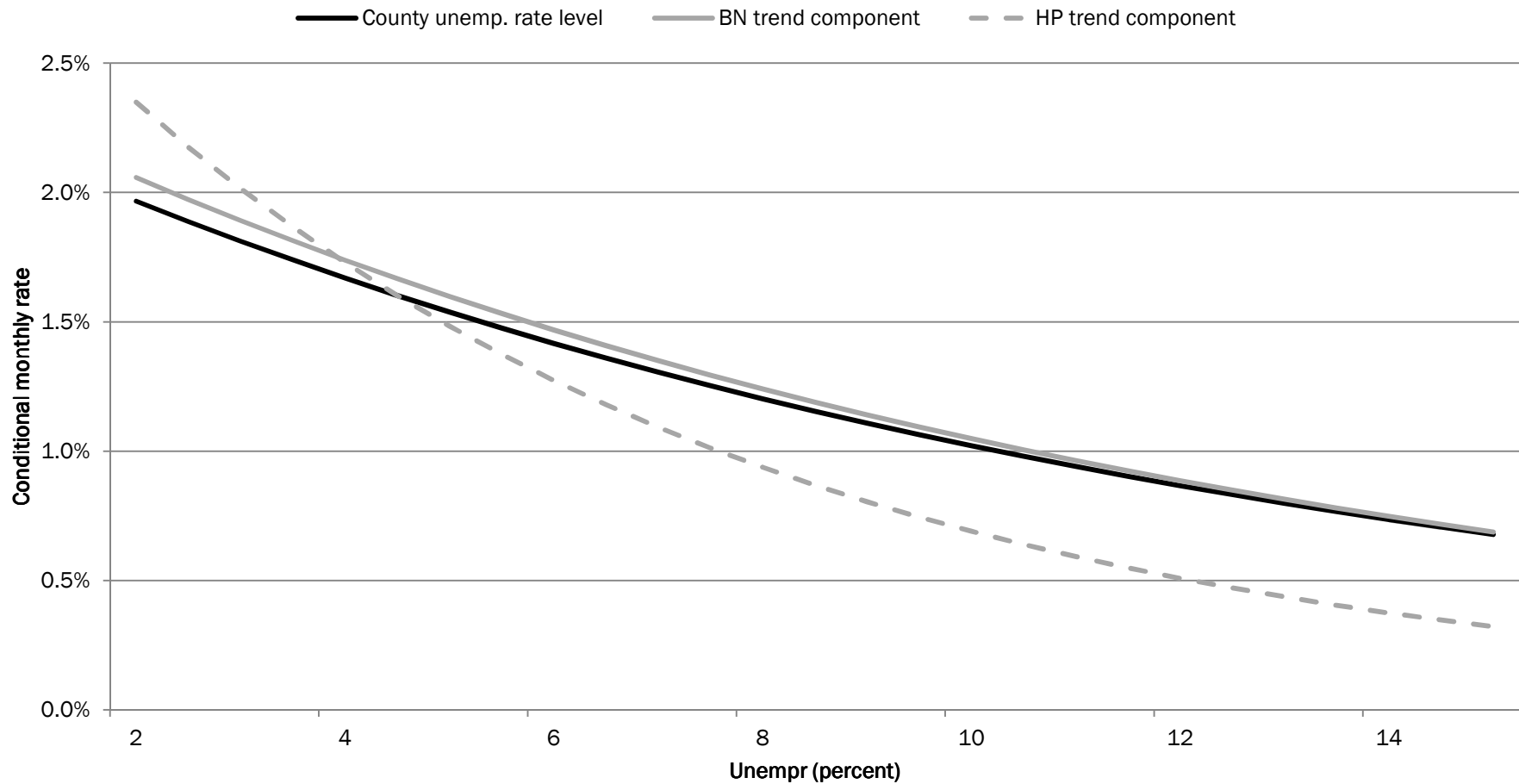


Default Probabilities vs. Unemployment



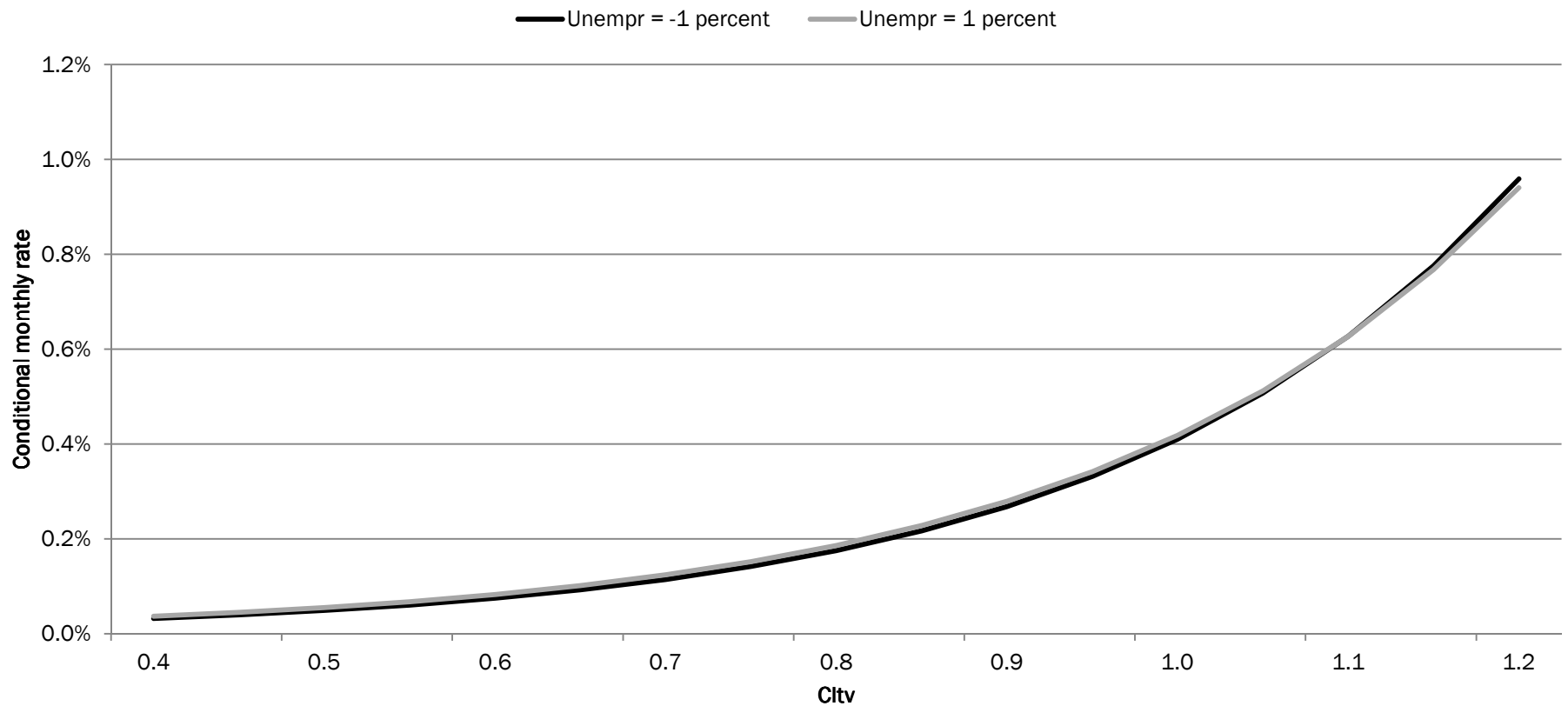


Prepayment Probabilities vs. Unemployment



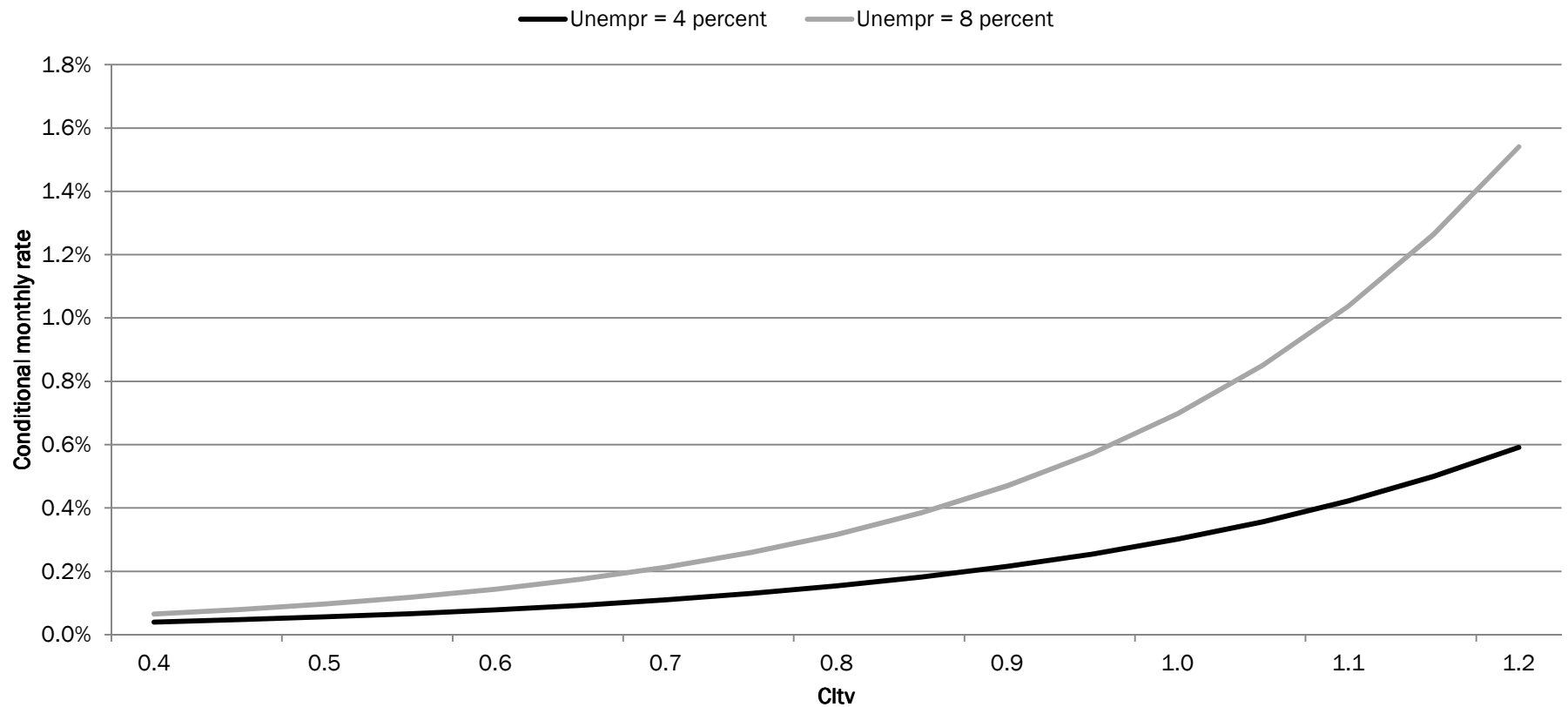


Default Probabilities wrt CLTV under Different Cyclical Unemp. (CBN) Conditions





Default Probabilities wrt CLTV under Different Trend Unemp. (THP) Conditions





Trend Unemployment (and How We Measure It) Matters

- Business cycle theory and mortgage performance
 - Long and short term unemployment have distinct impacts on mortgage performance.
 - Long term unemployment may change the way risk factors affect mortgage default.
- Policy makers and practitioners dealing with default risks may benefit from studying long term unemployment (how we measure it matters)
 - Temporary unemployment reduction measures are not likely to help ease mortgage defaults very much