Appendix A: Summary of key forecast assumptions by Iana Liadze

The forecasts for the world economy and the UK economy reported in this *Review* are produced using the National Institute's global econometric model, NiGEM. NiGEM has been in use at NIESR for forecasting and policy analysis since 1987, and is also used by a group of more than 40 model subscribers, mainly in the policy community. Further details, including articles by model users, are provided in the May 2018 edition of the *Review*. Most countries in the OECD are modelled separately,[1] and there are also separate models for Argentina, Brazil, Bulgaria, China, Hong Kong, India, Indonesia, Romania, Russia, Singapore, South Africa, Taiwan and Vietnam. The rest of the world is modelled through regional blocks so that the model is global in scope. All models contain

the determinants of domestic demand, export and import volumes, prices, current accounts and net assets. Output is determined in the long run by factor inputs and technical progress interacting through production functions, but is also affected by demand in the short to medium term. Economies are linked through trade, competitiveness and financial markets and are fully simultaneous. Further details on NiGEM are available on http://nimodel.niesr. ac.uk/.

The key interest rate and exchange rate assumptions underlying our current forecast are shown in tables A1–A2. Our short-term interest rate assumptions are generally based on current financial market expectations, as implied by the rates of return on treasury bills and

Table A1. Interest rates *Per cent per annum*

		Central bank intervention rates					10–year government bond yields				
		US	Canada	Japan	Euro Area	UK	US	Canada	Japan	Euro Area	UK
2016		0.51	0.50	−0.08	0.01	0.40	1.8	1.3	0.0	0.7	1.3
2017		1.10	0.70	−0.10	0.00	0.29	2.3	1.8	0.1	1.0	1.2
2018		1.90	1.40	−0.10	0.00	0.60	2.9	2.3	0.1	1.1	1.4
2019		*2.26*	*1.75*	*−0.10*	*0.00*	*0.75*	*2.1*	*1.5*	*−0.1*	*0.4*	*0.8*
2020		*1.75*	*1.50*	*−0.07*	*0.00*	*0.56*	*1.9*	*1.6*	*0.3*	*0.1*	*0.8*
2021		*1.75*	*1.50*	*−0.01*	*0.00*	*0.50*	*2.3*	*1.9*	*0.6*	*0.5*	*1.2*
2022–26		*2.48*	*2.02*	*0.56*	*0.33*	*1.31*	*3.0*	*2.7*	*1.4*	*1.6*	*2.2*
2018	Q1	1.53	1.20	−0.10	0.00	0.50	2.8	2.2	0.1	1.0	1.5
2018	Q2	1.80	1.25	−0.10	0.00	0.50	2.9	2.3	0.0	1.0	1.4
2018	Q3	2.01	1.47	−0.10	0.00	0.66	2.9	2.3	0.1	1.1	1.4
2018	Q4	2.28	1.69	−0.10	0.00	0.75	3.0	2.3	0.1	1.2	1.4
2019	Q1	2.50	1.75	−0.10	0.00	0.75	2.7	1.9	0.0	0.9	1.2
2019	Q2	2.50	1.75	−0.10	0.00	0.75	2.3	1.6	−0.1	0.6	1.0
2019	*Q3*	*2.31*	*1.75*	*−0.10*	*0.00*	*0.75*	*1.8*	*1.4*	*−0.2*	*0.0*	*0.6*
2019	*Q4*	*1.75*	*1.75*	*−0.10*	*0.00*	*0.75*	*1.6*	*1.3*	*0.0*	*−0.1*	*0.5*
2020	*Q1*	*1.75*	*1.50*	*−0.09*	*0.00*	*0.75*	*1.7*	*1.4*	*0.1*	*0.0*	*0.6*
2020	*Q2*	*1.75*	*1.50*	*−0.08*	*0.00*	*0.50*	*1.8*	*1.5*	*0.2*	*0.1*	*0.7*
2020	*Q3*	*1.75*	*1.50*	*−0.06*	*0.00*	*0.50*	*1.9*	*1.6*	*0.3*	*0.2*	*0.9*
2020	*Q4*	*1.75*	*1.50*	*−0.05*	*0.00*	*0.50*	*2.0*	*1.7*	*0.4*	*0.3*	*1.0*
2021	*Q1*	*1.75*	*1.50*	*−0.04*	*0.00*	*0.50*	*2.1*	*1.8*	*0.5*	*0.4*	*1.1*
2021	*Q2*	*1.75*	*1.50*	*−0.03*	*0.00*	*0.50*	*2.2*	*1.9*	*0.6*	*0.5*	*1.2*
2021	*Q3*	*1.75*	*1.50*	*−0.02*	*0.00*	*0.50*	*2.3*	*2.0*	*0.7*	*0.6*	*1.3*
2021	*Q4*	*1.75*	*1.50*	*0.03*	*0.00*	*0.50*	*2.4*	*2.0*	*0.7*	*0.7*	*1.4*

Table A2. Nominal exchange rates

| | Percentage change in effective rate | | | | | | | | Bilateral rate per US $ | | | |
	US	Canada	Japan	Euro Area	Germany	France	Italy	UK	Canadian $	Yen	Euro	Sterling
2016	5.2	0.3	15.1	4.7	2.4	2.4	2.9	−10.0	1.314	108.8	0.904	0.741
2017	0.4	2.0	−2.6	2.8	1.3	2.0	1.9	−5.3	1.294	112.2	0.887	0.776
2018	0.1	−1.8	1.5	4.9	2.6	2.6	3.3	2.1	1.314	110.4	0.847	0.749
2019	3.6	0.2	4.9	−1.1	−0.5	−0.8	−0.7	−1.2	1.329	108.8	0.895	0.790
2020	1.2	0.5	2.2	−0.1	0.0	−0.1	−0.2	−0.5	1.329	107.6	0.906	0.802
2021	−0.4	0.1	1.5	1.3	0.8	0.7	0.8	0.3	1.326	105.8	0.891	0.793
2018 Q1	−2.1	−2.2	2.3	1.8	0.8	1.0	1.2	1.9	1.294	108.3	0.813	0.718
2018 Q2	2.3	−0.7	0.7	−0.4	−0.2	−0.3	−0.2	0.3	1.313	109.2	0.839	0.735
2018 Q3	2.5	1.8	0.9	1.2	0.7	0.4	0.7	−1.7	1.304	111.5	0.860	0.767
2018 Q4	2.0	−2.4	−0.1	−0.6	−0.3	−0.4	−0.4	0.0	1.343	112.8	0.876	0.778
2019 Q1	−1.0	0.2	1.6	−0.8	−0.5	−0.5	−0.4	1.4	1.337	110.2	0.881	0.768
2019 Q2	0.7	0.9	1.1	−0.3	−0.1	−0.1	−0.2	−0.6	1.329	109.9	0.890	0.778
2019 Q3	1.0	1.1	3.4	−0.1	0.0	−0.1	−0.3	−3.5	1.320	107.3	0.900	0.811
2019 Q4	0.9	−0.4	0.0	−0.3	−0.1	−0.2	−0.2	1.7	1.329	107.9	0.909	0.805
2020 Q1	0.0	0.0	−0.1	0.0	0.0	0.0	0.0	0.1	1.329	108.0	0.909	0.804
2020 Q2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.329	108.0	0.909	0.804
2020 Q3	−0.1	0.0	0.4	0.3	0.2	0.2	0.2	0.1	1.328	107.5	0.905	0.801
2020 Q4	−0.1	0.0	0.4	0.3	0.2	0.2	0.2	0.1	1.328	107.0	0.901	0.799
2021 Q1	−0.1	0.0	0.4	0.4	0.2	0.2	0.2	0.1	1.327	106.5	0.897	0.796
2021 Q2	−0.1	0.0	0.4	0.4	0.2	0.2	0.2	0.1	1.326	106.1	0.893	0.794
2021 Q3	−0.1	0.0	0.4	0.4	0.2	0.2	0.2	0.1	1.325	105.6	0.889	0.791
2021 Q4	−0.1	0.0	0.4	0.4	0.2	0.2	0.2	0.1	1.324	105.1	0.885	0.789

government bonds of different maturities. Long-term interest rate assumptions are consistent with forward estimates from short-term interest rates, allowing for a country-specific term premium. Where term premia do exist, we assume they gradually diminish over time, such that long-term interest rates in the long run are simply the forward convolution of short-term interest rates.

Short-term interest rates are expected to remain unchanged until the end of this year in the UK, Euro Area, and Japan, but to be reduced in the US, which is broadly consistent with the path signalled by the Federal Open Market Committee (FOMC) minutes from its September meeting. As discussed in the UK chapter in this *Review*, we expect UK economic growth to return to a rate that is close to its potential within two years. Our central forecast assumes economic activity will be dampened by a high degree of uncertainty in the short run while trading relationships with the EU remain largely unchanged. It is conditioned on Bank Rate being cut by 25 basis points in the second quarter of 2020. Bank Rate is expected to reach 1.5 per cent in 2025, this being the point at which the MPC is assumed to stop reinvesting the proceeds from maturing gilts it

currently holds, allowing the Bank of England's balance sheet to shrink naturally'. [2]

Figure A1 illustrates the recent movement in, and our projections for, 10-year government bond yields in the US, Euro Area, the UK and Japan. The average levels of 10-year sovereign bond yields in the US, Euro Area, the UK and Japan decreased in the third quarter of 2019 relative to the previous quarter. While in the UK, the US and the Euro Area they decreased by about 50–60 basis points, in Japan they have fallen by less, by about 10 basis points. Expectations currently for bond yields for the end of 2019 are lower for the US, Euro Area and the UK by about 40–50 basis points, and by around 10 basis points for Japan, compared to expectations formed three months ago.

Sovereign risks in the Euro Area were a major macroeconomic issue for the global economy and financial markets over several years after the financial crisis. Figure A2 depicts the spread between 10-year government bond yields of Spain, Italy, Portugal and Ireland over Germany's. Political and budgetary issues led to Italy experiencing the largest increase in spreads in 2018 since 2013. Spreads in Italy remain elevated, leaving it as the worst performer, after Greece. We have
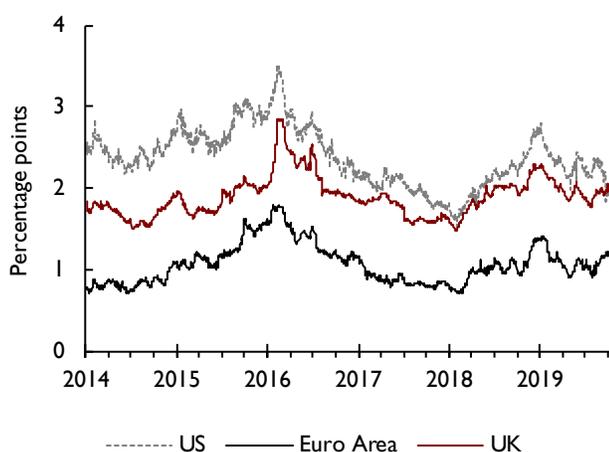
Figure A1. 10–year government bond yields
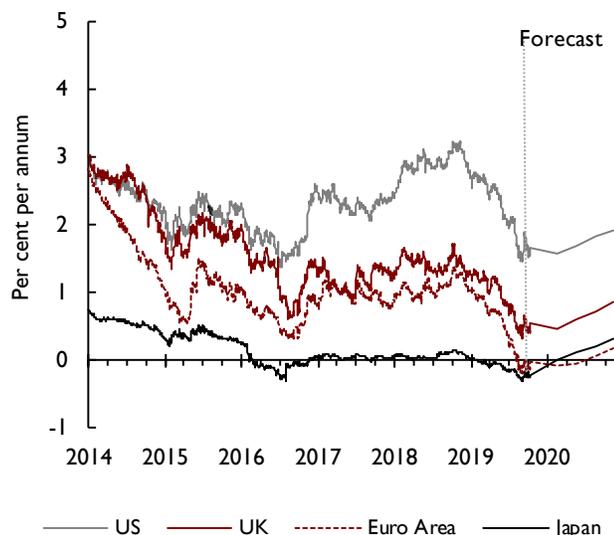
Source: Datastream and NIESR projections.

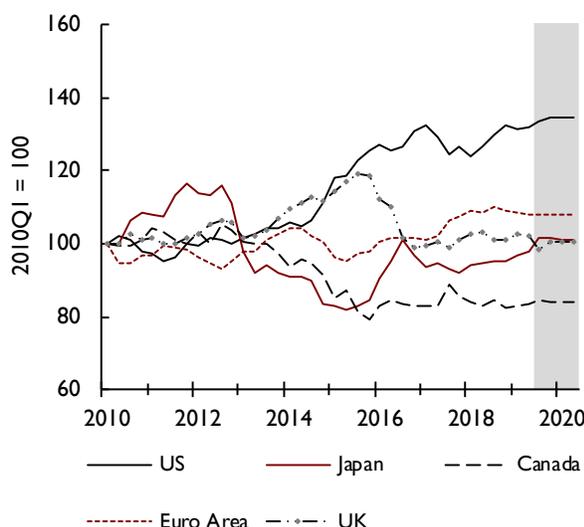## Figure A2. Spreads over 10–year German government bond yields
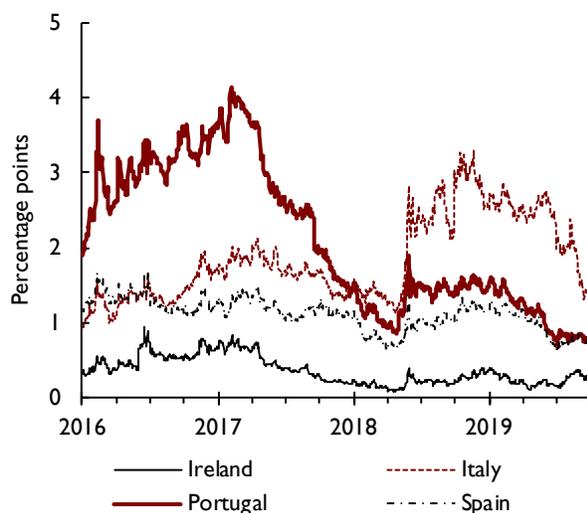
Source: Derived from Datastream series.

Figure A3. Corporate bond spreads. Spread between BAA corporate and 10–year government bond yields

Source: Derived from Datastream series.

Figure A4. Effective exchange rates

Source: NiGEM database and NIESR forecasts. Weights based on 2016 goods and services trade shares.

assumed that spreads over German bond yields narrow in all Euro Area countries over the course of the forecast horizon.

Figure A3 shows the spreads of corporate bond yields over government bond yields in the US, UK and Euro Area. This acts as a proxy for the margin between private sector and 'risk-free' borrowing costs. Since

the end of 2017 corporate bond spreads in the US, UK and Euro Area have been elevated, with private sector borrowing costs reducing less than the observed decrease in risk-free rates. However, spreads are still lower than the most recent peak at the beginning of 2016. Our forecast assumption for corporate spreads is that they gradually converge towards their long-term average level.

Figure A5. Oil prices
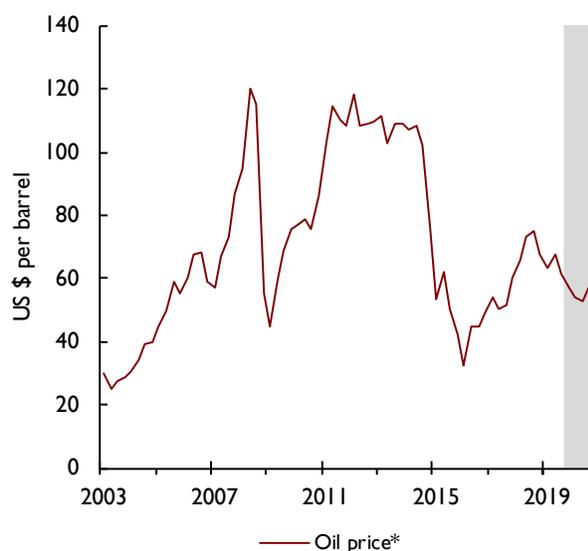
Source: NiGEM database and NIESR forecast.
Note: *Average of Dubai and Brent spot prices.

Figure A6. Share prices
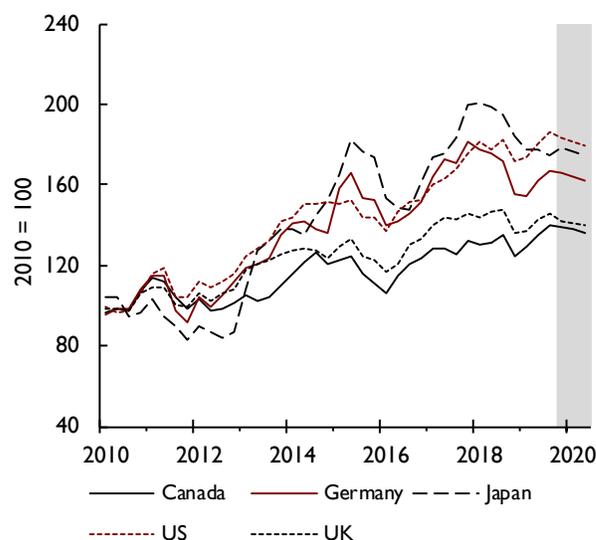
Source: NiGEM database and NIESR forecast.

Nominal exchange rates against the US dollar are generally assumed to remain constant at the rate prevailing on 11 October 2019 until the end of June 2020. After that, they follow a backward-looking uncovered-interest parity condition, based on interest rate differentials relative to the US. Figure A4 plots the recent history as well as our short-term forecast of the effective exchange rate indices for Canada, the Euro Area, Japan, the UK and the US. After appreciating by about 7 per cent, in trade-weighted terms, over the course of last year, the US dollar has depreciated, by about 2 per cent, since the beginning of 2019. After having strengthened by about 9 per cent over the past two years, the euro has lost slightly (about 1 per cent) in value in effective terms since the end of 2018. Among the developing economies' currencies in our model, the largest movement in trade-weighted terms between the third and the second quarters of 2019 has been the depreciation of the Argentinian peso and Chinese renminbi by about 12 and 2 per cent, respectively. Meanwhile Turkish and Indonesian currencies strengthened in effective terms by about 4 and 2 per cent, respectively.

Our oil price assumptions for the short term generally follow those of the US Energy Information Administration (EIA), published in October 2019, and updated with daily spot price data available up to 11 October 2019. The EIA uses information from forward markets as well as an evaluation of supply conditions. As illustrated in figure A5, oil prices, in US dollar terms, have fallen since the recent pick in October 2018, by about 20 per cent. Expectations for the oil price by the end of 2019 are lower compared to expectations three months ago, which leaves the oil price about $50 per barrel lower than its nominal level in mid-2014.

Our equity price assumptions for the US reflect the expected return on capital. Other equity markets are assumed to move in line with the US market, but are adjusted for different exchange rate movements and shifts in country-specific equity risk premia. Stock market performance in the third quarter of this year compared to the previous quarter has been strong, with equity prices increasing in most of the developed as well as developing economies. However, at the beginning of the fourth quarter sentiment in the stock markets has turned, with equity prices generally falling in the majority of the economies. Figure A6 illustrates the key short-term equity price assumptions underlying our current forecast.

NOTES
1 With the exception of Iceland and Israel.
2 Interest rate assumptions are based on information available for the period to 11 October 2019.