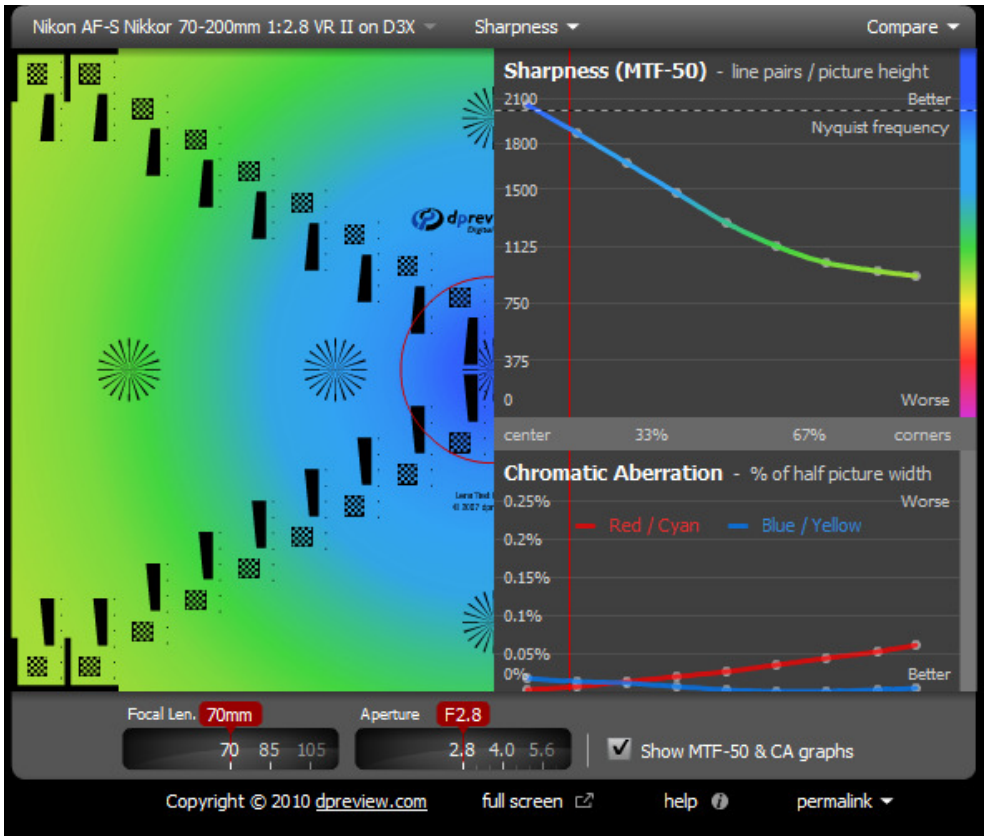
5. Test results

Studio Tests - FX format

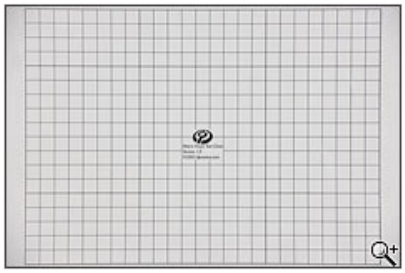


NOTE the line marked 'Nyquist Frequency' indicates the maximum theoretical resolution of the camera body used for testing. Whenever the measured numbers exceed this value, this simply indicates that the lens out-resolves the sensor at this point - the calculated MTF values themselves become meaningless.

The 70-200mm VR II performs very well on FX, essentially addressing the criticisms of its predecessor. Direct comparison of our sharpness data between the two lenses is complicated by the very different resolutions of the test bodies (D3 and D3X; specifically sharpness numbers above the D3's Nyquist line cannot be compared), but it's clear that the problems with soft corners and vignetting towards the tele end have essentially been resolved. An interesting comparison can also be drawn between the FX and DX data - it appears that the VR II design has been very carefully balanced to give equally good corner sharpness on both formats.

Sharpness	Wide open at F2.8, sharpness is excellent in the center of the frame, but it tends to fall off towards the edges; again best results are obtained at 200mm. Stop down a bit and the corners sharpen up nicely at all focal lengths, with none of the softness towards the tele end that plagued the older 70-200mm. Truly excellent results are obtained from F4 to at least F11 (with F5.6 generally being the very sharpest); stopping down further softens the image a little due to the inevitable effects of diffraction.
Chromatic Aberration	Chromatic aberration remains low on FX, with just-visible red/cyan fringing at 70mm, and blue/yellow fringing at 200mm. Again it diminishes on stopping down at 70mm; but in contrast to DX, at 200mm it becomes a bit more visible in the extreme corners at small apertures. Again none of this is much to worry about in real photography.
Falloff	We consider falloff to become perceptible when the corner illumination falls to more than 1 stop below the center. Falloff (or vignetting) is notably improved over the older lens; it's now just a stop and a third at all focal lengths, and the precipitous, fairly extreme drop in brightness towards the corners of the previous design has been eliminated. It also disappears pretty quickly on stopping down, except at full tele, where about a stop persists even at F8 to F11.
Distortion	Distortion is generally pretty low, indeed it's slightly reduced compared to the previous model. It's near-neutral at 70mm, with progressively increasing pincushion as you zoom in, reaching a maximum of -1.5% at 200mm. This is unlikely to be an problem for most typical uses of the lens.

Macro Focus



Macro - Approx 283 x 189 mm coverage
Distortion: Slight pincushion
Corner softness: Moderate
Focal length: 200mm

In a striking illustration of the lens's relatively low magnification, on full frame it covers an image area larger than our macro chart.

However, even under the microscope of the full frame D3X, the image quality is pretty impressive. Central sharpness is high wide open, and while the corners are a little soft, they sharpen up well by F8. Pincushion distortion has become quite noticeable, alongside the merest hint of blue/yellow chromatic aberration, but overall this is pretty impressive.

Specific image quality issues

As always, our studio tests are backed up by taking hundreds of photographs with the lens across a range of subjects, and examining them in detail. This allows us to confirm our studio observations, and identify any other issues which don't show up in the tests. The 70-200mm F2.8 VR II is a very solid performer indeed, consistently delivering sharp, properly focused images with the minimum of fuss.

Flare

The 70-200mm F2.8 VR II proudly displays a large gold 'N' badge on its name-plate, indicating the use of Nikon's latest 'Nano-Crystal Coat' for the suppression of flare (interestingly Canon has chosen not to use its similar-technology, but less marketably-entitled 'Sub Wavelength Structure Coating' on its own revised 70-200mm). Overall the lens seems to do a pretty good of dealing with difficult lighting, but that 'N' clearly isn't a panacea, and in difficult situations it's still capable of being completely overwhelmed by stray light.

With the sun placed in the frame, there's generally very little loss of contrast. just a typical diagonal flare spot pattern which gets progressively more delineated on stopping down. So far so good, but what can be rather more problematic is when the sun is outside the frame, but still impinging on the front element of the lens. Under these situations the image can lose contrast dramatically due to veiling flare.

70mm F22, Nikon D3X

70mm F4, Nikon D300

One contributory factor to this problem is that the HC-48 hood supplied with the lens is rather shallow - other telezooms tend to use deeper designs. But there appears to be no good reason for this - some ad hoc testing showed that the hood could be at least an inch deeper all round without showing any vignetting on FX. So, as it stands, the hood is simply less effective than it should be at shading the lens from the kind of lighting it finds most problematic.

Background Blur ('bokeh')

One genuinely desirable, but difficult to measure aspect of a lens's performance is the ability to deliver smoothly blurred out-of-focus regions when trying to isolate a subject from the background, generally when using a long focal length and large aperture. This is always a complex subject, highly dependent upon both the subject and background (or indeed foreground) distances.

After shooting hundreds of frames with the lens, it appears to have something of a split personality in this regard. At close distance in particular, it can give marked double-image 'nissen' bokeh, which isn't pretty. But more distant backgrounds are rendered very smoothly indeed, and in reality this is likely to be more representative of the most typical uses of this lens.

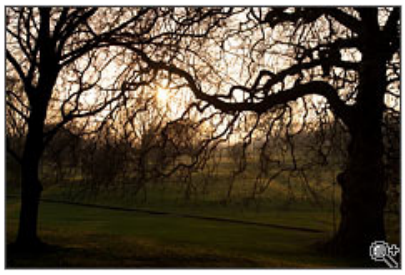
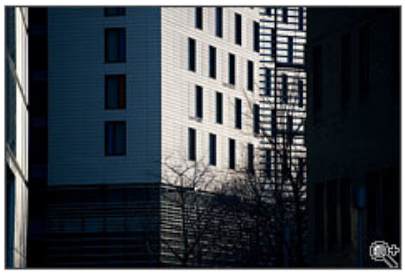
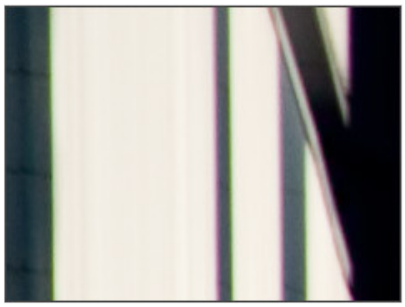
Close-up bokeh	Distant Bokeh

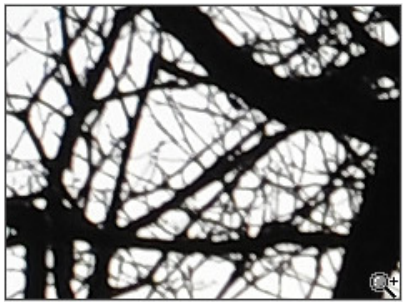
	
200mm F2.8, Nikon D300	200mm F2.8, Nikon D3X
	
33% crop, lower right - 'nissen' bokeh	33% crop, center

Chromatic Aberration

Lateral chromatic aberration is pretty well-controlled, but it can be visible at the two extremes of the zoom range. Note that many current and recent Nikon bodies process this out automatically when shooting in JPEG, as does ViewNX when processing RAW files - but if you use RAW with a more workflow-friendly 3rd party converter, you'll see this fringing in all its glory.

The D3X samples below show this, using Adobe Camera RAW as the processor. At 70mm we can see red/cyan fringing in the extreme corner of the frame, but bearing in mind this is a 100% crop from a 24Mp file, it would be churlish to complain too much about it. At 200mm there's a little bit of fringing, but its visibility is generally lower as it's mainly blue/yellow in character, with a very small red component. In both cases, the in-camera JPEG processing removes it very effectively.

D3X, 70mm F8	D3X, 200mm F2.8
	
RAW + ACR	RAW + ACR
	
100% crop, top left of frame	100% crop, left of frame

	
100% crop, camera JPEG	100% crop, camera JPEG

If you look very closely indeed, you can also sometimes see a hint of bokeh chromatic aberration (magenta in front of the plane of focus, green behind), but it's unlikely to be a concern to most users.

	
70mm F4, Nikon D300	
	
100% crop, center left	100% crop, center right

Change in Angle of View on Focusing ('Focus Breathing')

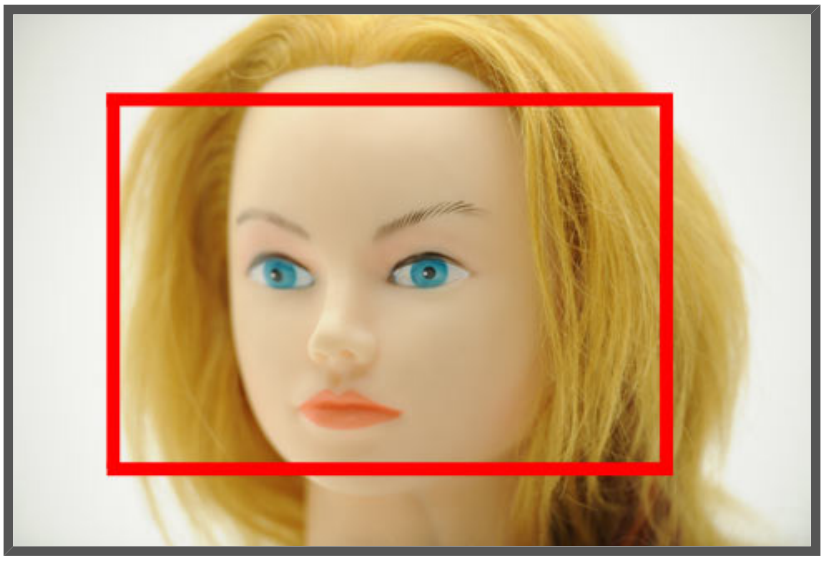
One of the more striking optical characteristics of the 70-200mm F2.8 VR II is that its angle of view widens considerably on focusing closer. This isn't, in itself, unusual, but the extent of the change is quite large (and rather more than the old lens). Much of the time it simply doesn't matter - you can just zoom in a bit, or move slightly closer to compensate - but in certain situations it's a genuine disadvantage. If you regularly find yourself with the lens always set to 200mm, and at a fixed distance from your subject (closer than about 3m), then the new lens's design may well cause you some real frustration.

This is an effect that's quite difficult to demonstrate in a visually meaningful fashion, especially with a 200mm lens, but the rollover below should give some idea of what's going on. A sequence of frames was shot using the D3X at 200mm F22, simply changing the focus distance as marked. Note how the lens appears to 'zoom out' as you focus closer. By our reckoning, at closest focus the image field is about 1.2x larger in each direction, making the effective focal length roughly 160mm at 1.4m.

Infinity **10 m** **5 m** **3 m** **2 m** **1.4 m**

Maximum magnification compared to AF-S 70-200mm F2.8 VR

Our macro tests measure the different coverages of the new and old lenses at minimum focus as 11.1 x 7.4 in and 7.6 x 5.2 in respectively on FX. To illustrate this more clearly, the shot below shows the smallest subject area that can be captured by the new lens, with the area covered by the old version outlined in red. Clearly the 'VR II' isn't capable of quite the same tight closeups as its predecessor (note though that our lovely model has a child-sized head). Remember also that the old lens's higher magnification comes at the cost of relatively poor image quality off-center.

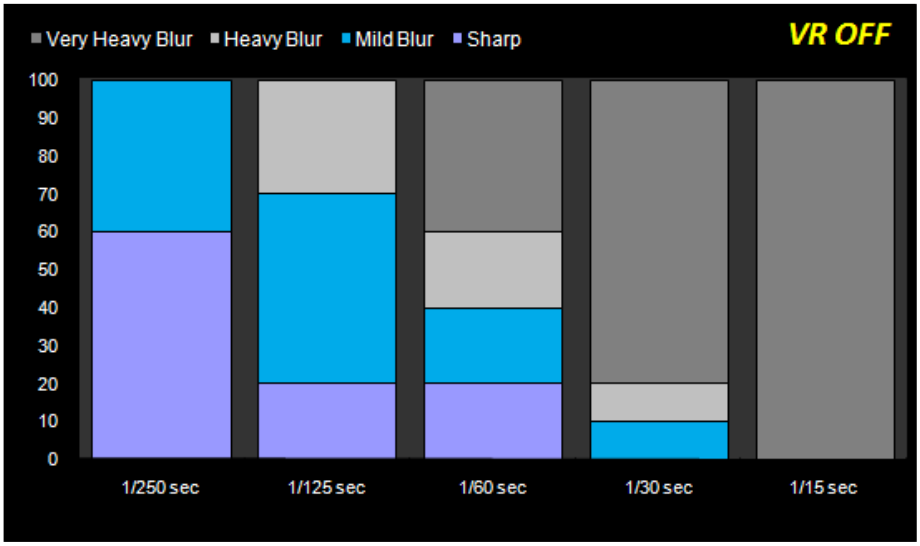


Optical Image Stabilization

The 70-200mm VR II features Nikon's second generation vibration reduction system, which claims to allow hand holding at shutter speeds up to four stops lower than usual before blur from camera shake becomes apparent. The mechanism is near-silent in use, with just a near-inaudible whirring noise when operational, and with distinct clicks when it activates and deactivates due to the VR group moving in and out of the 'at rest' position.

There are two modes available, 'Normal' and 'Active'. In Normal mode, the lens automatically detects when you're panning and turns off stabilization in the requisite direction. Active mode is supposedly 'quite useful when shooting from a moving vehicle or some other unstable position', but Nikon is rather vague in describing how it's technically different - we presume it stabilizes in both dimensions all the time. It's probably worth experimenting with both modes to find which works best for you (rather than just leaving the switch set to Normal).

To quantify the effectiveness of Nikon's VR II system we subjected the 70-200mm to our studio stabilization test at the wide and long ends of the range, using the D3X as the test camera. We take 10 shots at each shutter speed and visually rate them for sharpness. Shots considered 'sharp' have no visible blur at the pixel level, and are therefore suitable for viewing or printing at the largest sizes, whereas files with 'mild blur' are only slightly soft, and perfectly usable for all but the most critical applications. The subject distance for these tests was approximately 2m at 70mm, and 6m at 200mm.



70mm VR OFF **200mm VR OFF**

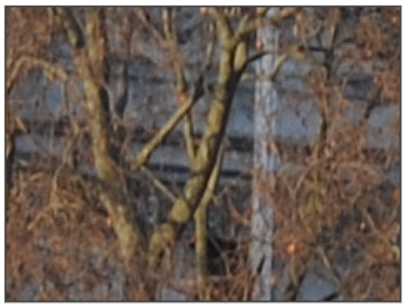
70mm VR ON **200mm VR ON**

We've generally found modern in-lens stabilization systems to be highly effective, and it comes as no surprise to see the same again here. The VR II system delivers essentially four stops of stabilization at 70mm (we get similar results at 1/5 sec, VR on as at 1/80 sec, VR off), and perhaps just shy of that at 200mm. Overall, this essentially matches anything else we've ever tested.

This also counts as a small, but welcome improvement over the previous version; and notably, we found the auto-panning detection to be less 'twitchy' than before, with a greatly reduced tendency to kick in during normal (non-panning) use and inactivate stabilization in one dimension when it's genuinely needed.

Real-world examples

To give an idea of how well the VR II system works in the field, the samples below show the kind of slow-speed hand-held shots we were able to get in everyday shooting.

70mm	200mm
	
Nikon D3X, 70mm 1/15 sec F2.8	Nikon D3X, 200mm, 1/25 sec F11
	
100% crop, lower center	100% crop, center